United States
Department of
Agriculture

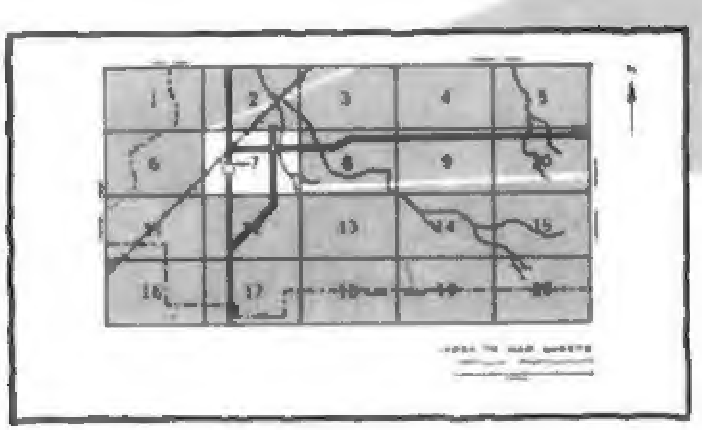
Soil
Conservation
Service

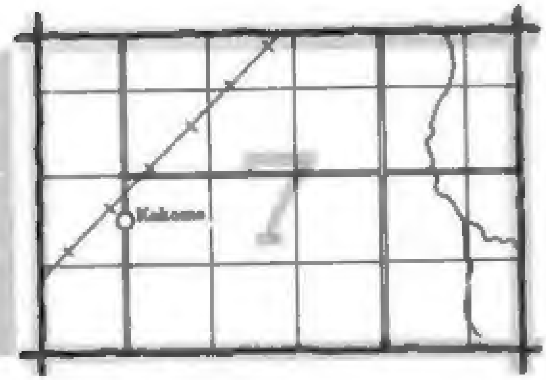
In cooperation with
United States
Department of
the Interior,
Bureau of
Indian Affairs,
and the South Dakota
Agricultural Experiment
Station

Soil Survey of Brule and Buffalo Counties, South Dakota

HOW TO USE

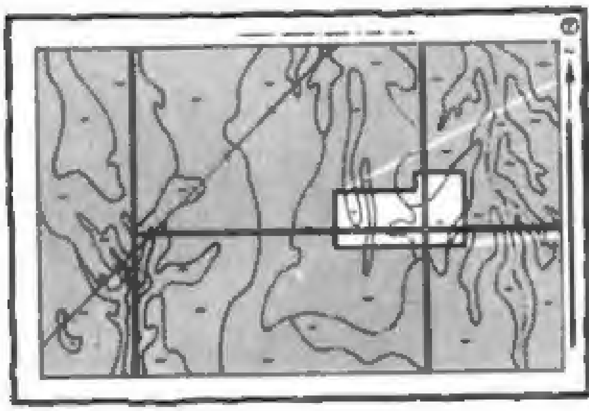
1. Locate your area of interest on the "Index to Map Sheets."

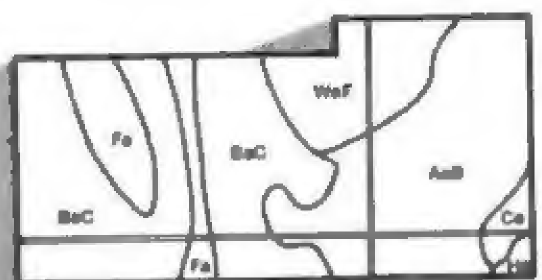




2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

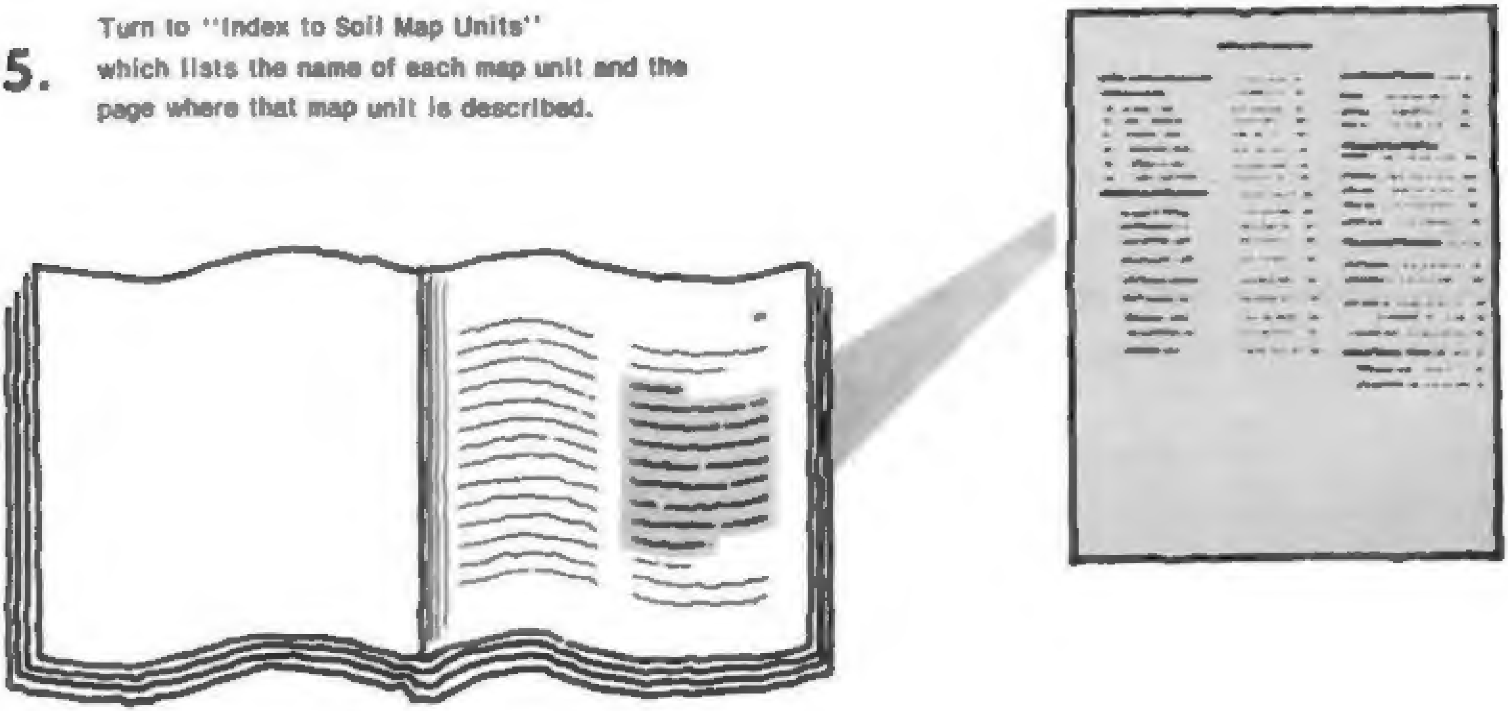




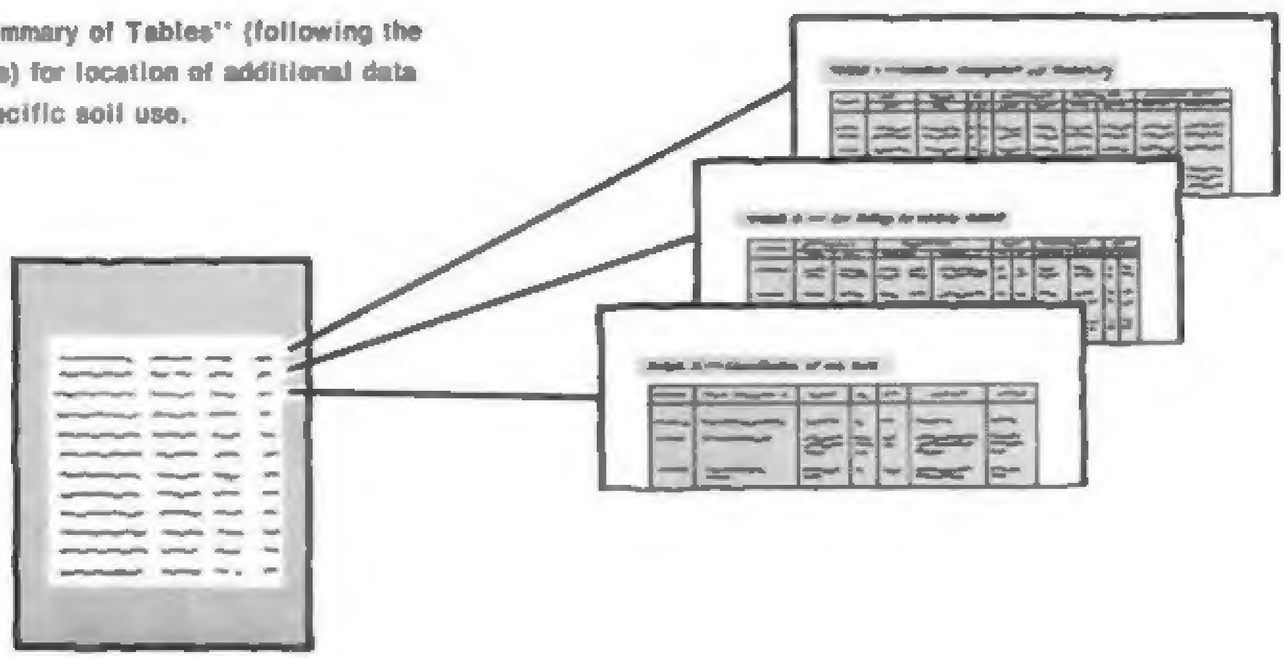
4. List the map unit symbols that are in your area.

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Soil Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Brule-Buffalo Conservation District. Financial assistance was furnished by the South Dakota Department of Revenue, the Old West Regional Commission, the Bureau of Indian Affairs, and the Brule Buffalo County Commissioners.

Cover: An area of Sansarc-Opal clays, 20 to 40 percent slopes, on breaks along the Missouri River. This area is used for range.

Contents

Soil Series

Issued December 1985

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Brule and Buffalo Counties, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

R. D. Swenson
State Conservationist
Soil Conservation Service

Soil Survey of
Brule and Buffalo Counties, South Dakota

By Regis L. Vialle, Soil Conservation Service

Soils surveyed by Karl J. Krueger, Wayne V. Vander Vorste, and
Regis L. Vialle, Soil Conservation Service, and
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United States Department of Agriculture, Soil Conservation Service,
in cooperation with the
United States Department of the Interior, Bureau of Indian Affairs,
and the South Dakota Agricultural Experiment Station

BRULE and BUFFALO COUNTIES are in the south-central part of South Dakota (fig. 1). They have a total area of 852,967 acres, or about 1,332 square miles, which includes about 30,803 acres of water. About 129,063 acres in Buffalo County is administered by the Bureau of Indian Affairs. Nearly all of this land is in the western part of the county. Fort Thompson is the agency headquarters of the Crow Creek Indian Reservation.

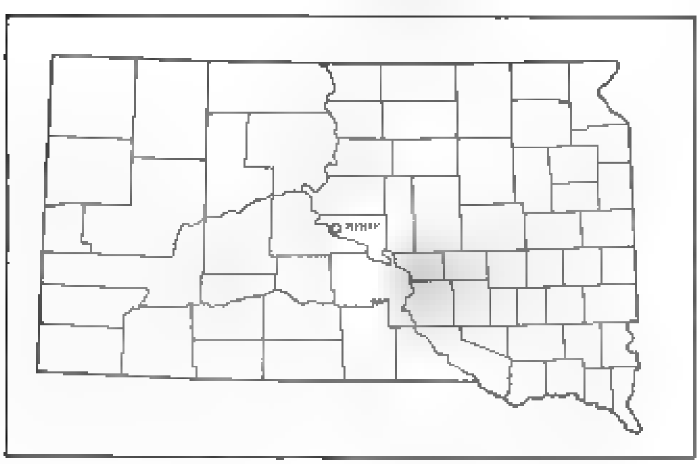

Figure 1.—Location of Brule and Buffalo Counties in South Dakota.

According to the 1980 census, Brule County has a population of 5,245 and Buffalo County one of 1,795. Chamberlain, the county seat of Brule County, has a population of 2,258. Gann Valley, the county seat of Buffalo County, is unincorporated. Other towns and villages in the survey area are Bijou Hills, Fort Thompson, Kimball, and Pukwana.

About 51 percent of Brule County and 22 percent of Buffalo County are cultivated cropland and tame pasture and hayland (*3*). Most of the remaining acreage supports native grasses. Alfalfa, corn, oats, grain sorghum, spring wheat, and winter wheat are the main crops. Farming is diversified. Livestock is the main source of income, but income from cash crops also is important.

General Nature of the Survey Area

This section gives general information concerning the counties. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Brule and Buffalo Counties are usually quite warm in summer, but hot spells are frequent and cool days occasional. The counties are very cold in winter, when arctic air frequently surges over the area. Most precipitation falls during the warm period, and rainfall is heaviest late in spring and early in summer. Winter

snowfall is normally not too heavy. It is blown into drifts, so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gann Valley and Chamberlain, South Dakota. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 18 degrees F at Gann Valley and 22 degrees at Chamberlain. The average daily minimum temperature is 7 degrees at Gann Valley and 11 degrees at Chamberlain. The lowest temperature on record, which occurred at Gann Valley on January 15, 1972, is -35 degrees. In summer the average temperature is 72 degrees at Gann Valley and 75 degrees at Chamberlain. The average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred at Gann Valley on July 10, 1976, and at Chamberlain on July 23, 1964, is 112 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 17 inches at Gann Valley and about 20 inches at Chamberlain. Of this, nearly 75 percent usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.65 inches at Gann Valley on July 26, 1968, and 3.04 inches at Chamberlain on August 5, 1960. Thunderstorms occur on about 44 days each year, and most occur in summer. Hail falls in scattered small areas during some of these storms.

The average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 20 inches at Gann Valley and 31 inches at Chamberlain. On the average, 40 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year. Blizzards occur several times each winter.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

Physiography, Relief, and Drainage

Brule and Buffalo Counties are within the Coteau du Missouri division of the Missouri Plateau (4). The Coteau du Missouri consists of gently rolling and hilly end moraines of the Mankato Substage of the Wisconsin Glaciation and nearly level to undulating ground moraines. Much of the material deposited on the ground moraines is silty glacial material. The steep trench of the Missouri River is along the western border of the counties. Most of the breaks along the river are clayey and are underlain by Pierre Shale. The flood plain along the Missouri River is inundated by Lake Francis Case and Lake Sharpe. The Bijou Hills are a prominent landmark in the southern part of Brule County. They occur as mesas that are 300 to 400 feet above the surrounding landscape and are capped by a thin layer of quartzitic sandstone. Below this cap rock is Pierre Shale.

American, Crow, Elm, Little Elm, Nelson, and Smith Creeks are the major drainageways. The creeks are intermittent and flow in the spring and after heavy rains. Except for Nelson Creek, all the creeks drain into Lake Francis Case. Nelson Creek drains into Red Lake.

Elevation ranges from about 1,300 feet above sea level in the southwestern part of Brule County to about 2,100 feet in the Bijou Hills. The lowest elevation is along Lake Francis Case.

Settlement

The first permanent settlers in Brule County arrived from Iowa in 1873. They settled in an area near the Missouri River where a town known as Brule City was founded. In 1875, further settlement was prohibited by executive order until 1879.

Brule County was established in 1875 (5). It was named after the Brule band of Teton Sioux who inhabited the area. It was reorganized in 1879, when settlement was again permitted. The first county seat was Brule City, which is now inundated by Lake Francis Case. The county seat was transferred to Chamberlain in 1880, after a vote by the county residents.

By 1890, Brule County had a population of 6,737. The population reached a peak of 7,416 in 1930. It declined to 6,076 by 1950 and 5,245 by 1980.

South Dakota State Highways 45 and 50 and Interstate Highway 90 are the main thoroughfares in Brule County. Most rural areas are served by all-weather roads to centers of trade. A small airport is at Chamberlain. Railroad transportation was extended into the county in the late 1800's. In 1905, the first railroad bridge was constructed across the Missouri River at Chamberlain.

The first permanent settlers in Buffalo County arrived in 1882. Prior to this date, fur traders and explorers frequently camped along the Missouri River and traded with the Indians. The headquarters for the Crow Creek Indian Reservation was established at Fort Thompson in 1862.

The present boundaries of Buffalo County were established in 1885, the year the county was organized (6). At one time, Buffalo County was the largest county

in the Dakota Territory. The western part of the county contains part of the Crow Creek Indian Reservation. Gann Valley was selected as the county seat in 1888.

By 1890, Buffalo County had a population of 993. The population reached a peak of 1,931 in 1930. It declined to 1,547 by 1960 and rose to 1,795 by 1980.

South Dakota State Highways 34, 45, 47, and 50 are the main thoroughfares in Buffalo County. Many rural areas are served by poor roads. Big Bend Dam, constructed on the Missouri River in the early 1960's, impounds water that forms Lake Sharpe.

Farming

Farming is the principal enterprise in Brule and Buffalo Counties. About 84 percent of the farm income in the survey area is derived from the sale of livestock and livestock products (*13*). Most of the remainder of the farm income is derived from the sale of small grain and corn. Some of the crops are used as feed for livestock.

In 1978, there were 455 farms in Brule County and 101 in Buffalo County. The farms average about 1,012 acres in size in Brule County and 3,148 acres in Buffalo County. The trend is toward fewer and larger farms in both counties.

About 51 percent of the acreage in Brule County is used for cultivated crops or for tame pasture and hay, and about 44 percent is range (*3*). In Buffalo County only about 22 percent of the acreage is used for cultivated crops or for tame pasture and hay, and about 75 percent is range. Dryland farming is dominant in both counties. About 8,000 acres, however, was irrigated in 1982. Nearly all irrigation is by the sprinkler method.

Wheat, corn, oats, and grain sorghum are the main cultivated crops. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the main crops grown for hay. In Brule County corn was grown on 41,700 acres in 1981, oats on 35,400 acres, sorghum on 20,000 acres, and wheat on 30,200 acres (*7*). In Buffalo County corn was grown on 6,200 acres, oats on 8,300 acres, sorghum on 10,000 acres, and wheat on 9,300 acres. The corn from 29,700 acres in Brule County and from 2,800 acres in Buffalo County was harvested for grain. The rest was used for silage.

The Brule-Buffalo Conservation District was organized in 1938 to help farmers control erosion problems. The district has been instrumental in planting trees on hundreds of acres since it was organized.

Natural Resources

Soil is the most important natural resource in the survey area. It provides a growing medium for crops and for the grass grazed by livestock. Other natural resources are water, wildlife, and sand and gravel.

Lake Francis Case and Lake Sharpe are excellent sources of water for domestic and industrial use and for irrigation. Many small dams, dugouts, and flows of the larger creeks provide water for livestock in most parts of the counties. In Brule County the principal source of water for domestic use and for livestock is shallow wells. Because many areas in Buffalo County do not have a shallow source of water, deep wells, drilled to a depth of 900 to 1,500 feet, are an additional source of water. Water quantity generally is greater in the deep wells, but the quality is poor because of a high content of soluble salts.

Scattered deposits of sand and gravel are throughout the survey area. Because of an excessive amount of fine rock fragments, such as shale, chalk, and clay ironstone, the sand and gravel is unsuitable as concrete aggregate or as construction material. It is suitable, however, as subgrade material for roads and as bituminous aggregate.

Coyote, cottontail, red fox, whitetail deer, and upland game birds, such as gray partridge, grouse, and ring-necked pheasant, are the chief wildlife resources. The wetlands, mainly in the southeastern part of the survey area, provide wetland wildlife production areas. In the spring and fall numerous species of ducks and geese migrate through the survey area. Bass, bluegill, perch, and other fish inhabit most of the smaller bodies of water. Lake Francis Case and Lake Sharpe provide excellent camping, fishing, and boating opportunities.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes, the general pattern of drainage; the kinds of crops and native plants growing on the soils, and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 14 associations in this survey area have been grouped for broad interpretative purposes. The associations and the groups are described on the pages that follow. Because of changes or refinements in some series concepts and differences in the design or extent of the map units, the names of the associations do not coincide exactly with those on the general soil maps in the published surveys of Aurora, Charles Mix, and Hand Counties, South Dakota.

Soil Descriptions

Nearly Level to Rolling, Loamy Soils Underlain by Sand and Gravel; on Outwash Plains and Terraces

These soils dominantly are undulating to rolling but are nearly level in places. They make up about 1 percent of the survey area. About 80 percent of the acreage is range. Conserving moisture and controlling erosion are the main management concerns.

1. Oahe-Delmont Association

Well drained and somewhat excessively drained, nearly level to rolling, loamy soils that are shallow or moderately deep over sand and gravel, on outwash plains and terraces

This association is on outwash plains and terraces. The slopes generally are undulating to rolling but are nearly level in places. In most places the drainage pattern is well defined, but it is poorly defined in the nearly level areas.

This association makes up about 1 percent of the survey area. It is about 30 percent Oahe soils, 30 percent Delmont soils, and 40 percent minor soils.

The well drained Oahe soils are on the smoother parts of the landscape. Slopes range from 0 to 6 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown loam and clay loam. The upper part of the underlying material is grayish brown, calcareous loam. The lower part is multicolored, calcareous gravelly loamy sand.

The somewhat excessively drained Delmont soils are on ridges and knolls. Slopes range from 2 to 15 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark gray, calcareous loam. The underlying material is multicolored, calcareous gravelly sand.

Minor in this association are the Bon, Durrstein, Egas, Egas Variant, Farmsworth, and Ree soils. Except for the Ree soils, the minor soils are on narrow flood plains. Ree soils are in positions on the landscape similar to those of the Oahe soils. The minor soils are not underlain by sandy and gravelly material.

About 80 percent of this association supports native grasses and is used for grazing or hay. Some areas are cultivated. Small grain and sorghum are the main crops. Conserving moisture and controlling erosion are the main concerns in managing the major soils for cultivated crops. This association is suited to range. The Oahe soils and the gently sloping areas of the Delmont soils are suited to cultivated crops and to tame pasture and hay, but they are droughty.

Nearly Level to Steep, Silty and Loamy Soils on Uplands and in Upland Swales

These soils dominantly are nearly level to gently rolling but are steep in some areas. They make up about 59 percent of the survey area. About 64 percent of the acreage is cropland. Corn, oats, alfalfa, sorghum, and wheat are the main crops. Controlling erosion and conserving moisture are the main management concerns.

2. Lowry-Sully Association

Deep, well drained, nearly level to steep, silty soils on

uplands

This association is on uplands characterized by smooth, nearly level to steep slopes. The drainage pattern is poorly defined in the nearly level areas and well defined in the steeper areas.

This association makes up about 4 percent of the survey area. It is about 50 percent Lowry and similar soils, 25 percent Sully soils, and 25 percent minor soils.

The Lowry soils are on smooth side slopes and in nearly level areas. Slopes range from 0 to 15 percent. Typically, the surface layer is grayish brown silt loam. The subsoil is grayish brown and brown silt loam. It is calcareous in the lower part. The underlying material is pale brown, calcareous silt loam and loam.

The Sully soils are in the steeper, more convex areas. Slopes range from 6 to 40 percent. Typically, the surface layer is grayish brown silt loam. The underlying material is brown and light yellowish brown, calcareous silt loam.

Minor in this association are the clayey Opal and Sansarc soils, which are underlain by shale, and the loamy Orton soils, which are underlain by gravelly material. Opal and Sansarc soils are on the steeper slopes, generally below the Lowry and Sully soils on the landscape. Orton soils are in positions on the landscape similar to those of the Lowry soils.

About 60 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Some areas are used for tame pasture and hay. The steeper, more inaccessible areas support native grasses and are used for grazing. Conserving moisture and controlling erosion are the main concerns in managing cultivated areas. This association is suited to range, cultivated crops, and tame pasture and hay, but in some areas the Sully soils are too steep for cultivated crops.

3. Uly Association

Deep, well drained, nearly level to moderately sloping, silty soils on uplands

This association is on uplands characterized by smooth slopes. The slopes generally are nearly level and gently sloping but are moderately sloping in places. In most areas the drainage pattern is well defined, but it is poorly defined in some of the nearly level areas.

This association makes up about 4 percent of the survey area. It is about 80 percent Uly and similar soils and 20 percent minor soils.

The Uly soils have a slope of 0 to 9 percent. Typically, the surface and subsurface layers are grayish brown silt loam. The subsoil is brown and pale brown silt loam. It is calcareous in the lower part. The underlying material is pale brown and very pale brown, calcareous silt loam.

Minor in this association are the McClure, Mobridge, Plankinton, and Sully soils. McClure soils are underlain by clayey material. They are in positions on the landscape similar to those of the Uly soils. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions. Sully soils are not so deep to lime as the Uly soils. Also, they contain less clay throughout. They are on the steeper parts of the landscape.

About 90 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Controlling erosion and conserving moisture are the main concerns in managing the major soils for cultivated crops. This association is suited to cultivated crops, tame pasture and hay, and range.

4. Highmore-Mobridge Association

Deep, well drained and moderately well drained, nearly level to gently rolling, silty soils on uplands and in upland swales

This association is on uplands characterized by gentle rises and many shallow swales. Slopes generally are nearly level to undulating but are gently rolling in some areas. The drainage pattern is poorly defined in areas where drainageways terminate in small depressions. A few scattered small stones are on the surface in some areas of the Highmore soils.

This association makes up about 14 percent of the survey area. It is about 40 percent Highmore soils, 20 percent Mobridge soils, and 40 percent minor soils (fig. 2).

The well drained Highmore soils are on the high parts of the landscape. Slopes typically are less than 4 percent but range from 0 to 9 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is brown and light brownish gray silty clay loam. It is calcareous in the lower part. The underlying material is pale yellow, light yellowish brown, and light gray, calcareous silt loam.

The moderately well drained Mobridge soils are in swales that are occasionally flooded. Slopes range from 0 to 3 percent. Typically, the surface and subsurface layers are very dark grayish brown silt loam. The subsoil is dark grayish brown, grayish brown, and light brownish gray silty clay loam. It is calcareous in the lower part. The underlying material is light yellowish brown, calcareous silty clay loam.

Minor in this association are the DeGrey, Eakin, Java, and Plankinton soils. The sodium affected DeGrey soils are on flats and in slightly concave areas. The silty Eakin soils are 20 to 40 inches deep to loamy glacial till. They are in positions on the landscape similar to those of the Highmore soils. The loamy Java soils are on knolls and ridges. The poorly drained Plankinton soils are in depressions.

About 75 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Conserving moisture and controlling erosion are the main concerns in managing the major soils for

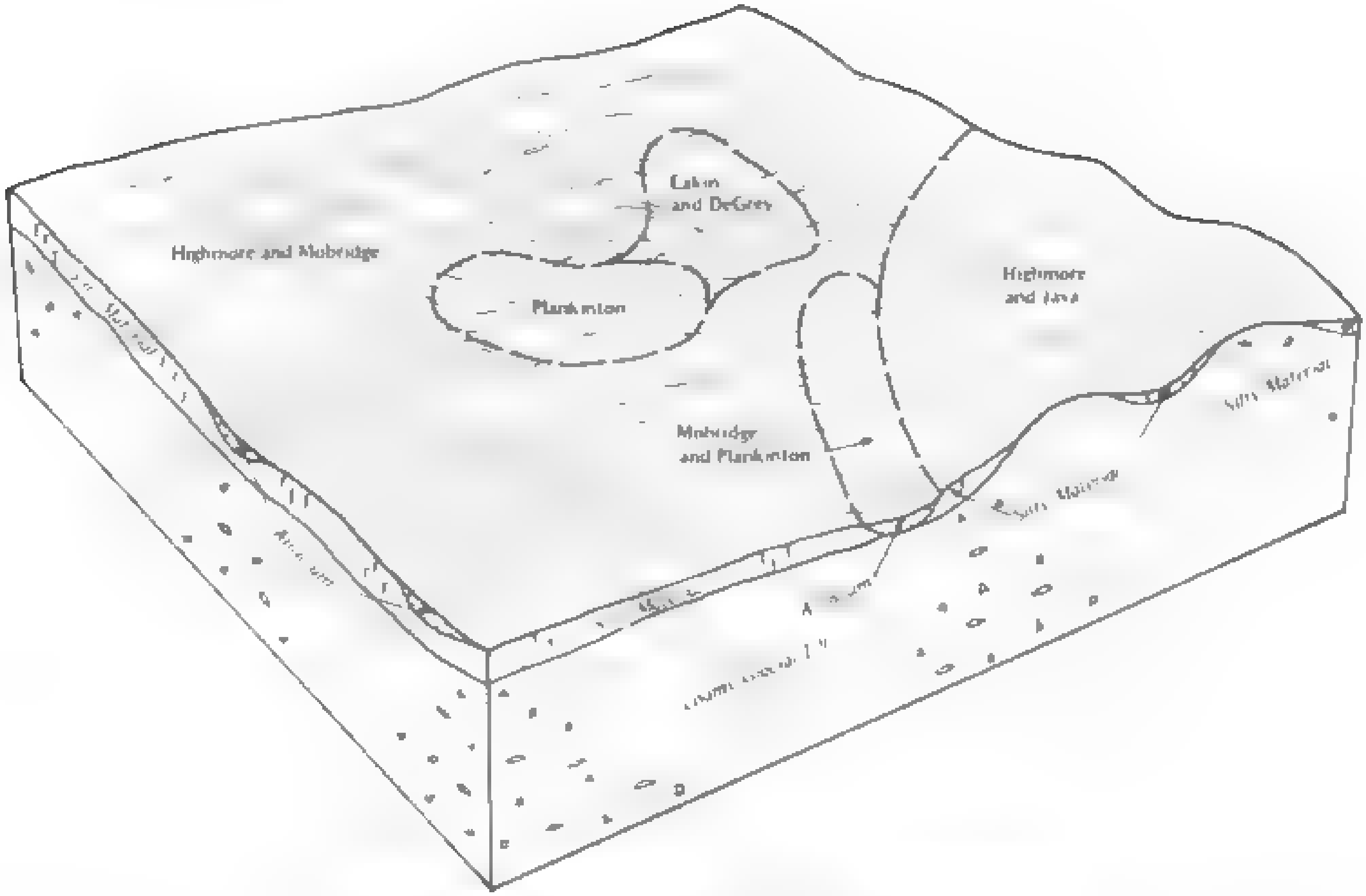

Figure 2.—Pattern of soils and parent material in the Highmore-Mobridge association.

cultivated crops. This association is suited to cultivated crops, tame pasture and hay, and range

5. Highmore-Java-Glenham Association

Deep, well drained, nearly level to gently rolling, silty and loamy soils on uplands

This association is on uplands characterized by gentle rises, swales, and depressions. The drainage pattern is well defined in most areas but is poorly defined in those areas where the drainageways terminate in small depressions. Scattered stones are on the surface in some areas.

This association makes up about 24 percent of the survey area. It is about 25 percent Highmore soils, 20 percent Java soils, 15 percent Glenham soils, and 40 percent other soils.

The Highmore soils are on smooth slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark brown and light yellowish brown silty clay loam. It is calcareous in the lower part. The upper part of the underlying material is light yellowish brown, calcareous silty clay loam. The lower part is brownish gray, calcareous clay loam.

The Java soils are on convex slopes. In this association they have a slope of 2 to 9 percent. Typically, the surface layer is dark grayish brown calcareous loam. The subsoil is dark grayish brown and pale brown, calcareous loam. The underlying material is pale brown and light yellowish brown, calcareous loam and clay loam.

The Glenham soils are on smooth and convex slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown, brown, and light brownish gray clay loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay loam.

Minor in this association are the Bon, DeGrey, Delmont, Durrstein, Farmsworth, Jerauld, Lane,

Mobridge and Plankinton soils. Bon, Durrstein, and Farmsworth soils are on flood plains. DeGrey and Jerauld soils are in small depressions in the uplands. Delmont and Lane soils are on terraces. Bon soils are stratified and are dark to a depth of more than 20 inches. DeGrey, Durrstein, Farmsworth, and Jerauld soils have a sodium affected subsoil. Delmont soils are underlain by gravelly material. Lane soils contain more clay in the subsoil than the major soils. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

About 55 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Conserving moisture, maintaining fertility, and controlling erosion are the main concerns in managing the cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, and range.

6. Eakin-DeGrey Association

Deep, well drained and moderately well drained, nearly level and gently undulating, silty soils on uplands

This association is on uplands characterized by gentle rises, slight swales, and depressions. In most areas the drainage pattern is poorly defined, but it is well defined along the larger drainageways. Scattered stones are on the surface in most areas.

This association makes up about 13 percent of the survey area. It is about 30 percent Eakin soils, 25 percent DeGrey soils, and 45 percent minor soils (fig. 3).

The well drained Eakin soils are on slight rises. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown, grayish brown, and light yellowish brown silty clay loam and silt loam. It is calcareous in the lower part. The underlying material is grayish brown, calcareous clay loam.

The moderately well drained, sodium affected DeGrey soils are in smooth or slightly concave areas. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is

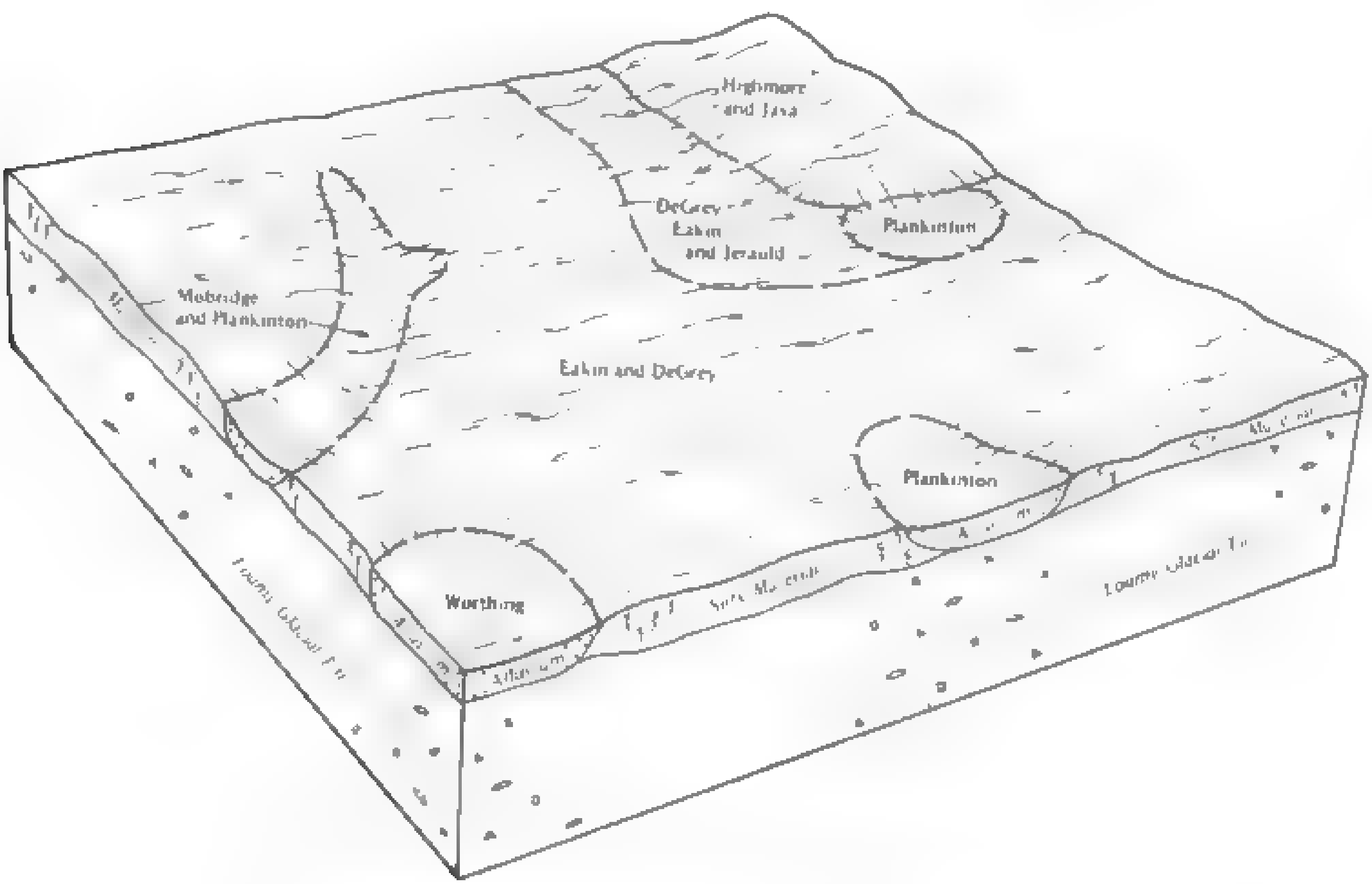

Figure 3.—Pattern of soils and parent material in the Eakin-DeGrey association.

grayish brown silt loam. The subsoil is dark grayish brown and grayish brown silty clay and silty clay loam. It is calcareous in the lower part. The underlying material is pale brown and light brownish gray, calcareous silty clay loam and clay loam.

Minor in this association are the Highmore, Java, Jerauld, Mobridge, Plankinton, and Worthing soils. Highmore soils are more than 40 inches deep to loamy glacial till. They are in positions on the landscape similar to those of the Eakin soils. The loamy Java soils are on the ridges and side slopes along drainageways. The sodium affected Jerauld soils are in small pits and depressions. Mobridge soils are dark to a depth of more than 20 inches. They are in swales. The poorly drained Plankinton and very poorly drained Worthing soils are in depressions.

About 60 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Conserving moisture and improving tilth are the main concerns in managing cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, and range, but the sodium affected subsoil in the DeGrey soils is a limitation.

Level to Gently Rolling, Loamy and Silty Soils on Uplands and in Upland Depressions

These soils dominantly are undulating and gently rolling but are level or nearly level in some areas. They make up about 10 percent of the survey area. About 55 percent of the acreage supports native grasses and is used for grazing or hay. Corn, oats, alfalfa, and sorghum are the main crops. Controlling erosion is the main management concern.

7. Beadle-Plankinton-Eakin Association

Deep, well drained and poorly drained, level to gently rolling, loamy and silty soils on uplands and in upland depressions

This association is on uplands characterized by many scattered depressions. The drainage pattern is poorly defined, and most of the runoff accumulates in closed depressions. Scattered stones commonly are on the surface.

This association makes up about 2 percent of the survey area. It is about 30 percent Beadle soils, 20 percent Plankinton and similar soils, 15 percent Eakin soils, and 35 percent minor soils.

The well drained Beadle soils are on side slopes. Slopes range from 1 to 9 percent. Typically, the surface layer is dark gray loam. The subsoil is dark grayish brown and grayish brown clay loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay loam.

The poorly drained Plankinton soils are in depressions. Slopes are less than 1 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray silt loam. The subsoil is dark gray silty clay. The underlying material is grayish brown, calcareous silty clay and silty clay loam.

The well drained Eakin soils generally are on the high parts of the landscape. Slopes range from 0 to 3 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown, grayish brown, light yellowish brown silty clay loam and silt loam. It is calcareous in the lower part. The underlying material is grayish brown, calcareous clay loam.

Minor in this association are the DeGrey, Java, Jerauld, and Mobridge soils. The sodium affected DeGrey and Jerauld soils are in small pits and depressions. The calcareous Java soils are on some ridges and knolls. The moderately well drained Mobridge soils are in swales.

About 75 percent of this association supports native grasses and is used for grazing or hay. Some areas are used for cultivated crops or for tame pasture and hay. Controlling erosion on the Beadle soils and controlling wetness on the Plankinton soils are the main management concerns in cultivated areas. This association is suited to range, cultivated crops, and tame pasture and hay. The numerous depressions are potential sites for stock water impoundments.

8. Glenham-Java-Highmore Association

Deep, well drained, nearly level to gently rolling, loamy and silty soils on uplands

This association is on uplands that are characterized by numerous swales and depressions. The drainage pattern is well defined in most areas, but it is poorly defined in those areas where drainageways terminate in small depressions. Scattered stones commonly are on the surface.

This association makes up about 8 percent of the survey area. It is about 30 percent Glenham soils, 20 percent Java soils, 15 percent Highmore soils, and 35 percent minor soils.

The Glenham soils are on smooth and convex slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown, brown, and light brownish gray clay loam. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay loam.

The Java soils are on convex slopes. In this association they have a slope of 2 to 9 percent. Typically, the surface layer is dark grayish brown, calcareous loam. The subsoil is dark grayish brown and pale brown, calcareous loam. The underlying material is pale brown and light yellowish brown, calcareous loam and clay loam.

The Highmore soils are on smooth slopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark brown and light yellowish brown silty clay loam. It is calcareous

in the lower part. The upper part of the underlying material is light yellowish brown, calcareous silty clay loam. The lower part is light brownish gray, calcareous clay loam.

Minor in this association are the DeGrey, Delmont, Jerauld, Plankinton, Schamber, and Worthing soils. DeGrey and Jerauld soils have a sodium affected subsoil. They are in small pits and depressions in the uplands. Delmont and Schamber soils are underlain by gravelly material. They are on terraces. The poorly drained Plankinton and very poorly drained Worthing soils are in depressions.

About 50 percent of this association is cropland. Alfalfa, corn, small grain, and sorghum are the main crops. Conserving moisture, maintaining fertility, and controlling erosion are the main concerns in managing the cultivated areas. The major soils are suited to cultivated crops, tame pasture and hay, and range.

Level, Silty Soils on Flood Plains

These soils make up about 1 percent of the survey area. About 95 percent of the acreage is range.

9. Durrstein-Egas Association

Deep, poorly drained, level, silty soils on flood plains

This association is on the flood plains along some of the larger drainageways. It generally is dissected by meandering channels. The drainage pattern is poorly defined in all areas, except for those near the channels.

This association makes up about 1 percent of the survey area. It is about 45 percent Durrstein soils, 45 percent Egas soils, and 10 percent minor soils.

The Durrstein soils are on broad flats. Slopes are less than 1 percent. Typically, the surface layer is gray silt loam. The subsoil is dark gray and gray silty clay. It is calcareous in the lower part. The underlying material is gray, calcareous silty clay. It has accumulations of carbonate and nests of gypsum and other salts throughout.

The Egas soils are on broad flats. Slopes are less than 1 percent. Typically, the surface layer is gray silty clay loam. The subsurface layer is dark gray silty clay. The next layer is dark gray, calcareous silty clay. The underlying material is gray and light gray, calcareous silty clay and clay loam. In most places visible salts are within a few inches of the surface.

Minor in this association are the Bon, Delmont, Farmsworth, Lane, Oahe, and Ree soils. Bon, Delmont, Lane, Oahe, and Ree soils do not have an accumulation of visible salts. Also, Delmont and Oahe soils are underlain by gravelly material. Delmont, Oahe, and Ree soils are on terraces. The somewhat poorly drained Farmsworth soils and the Bon and Lane soils are slightly higher on the flood plains than the Durrstein soils.

About 95 percent of this association supports native grasses and is used for grazing or hay. Measures that prevent overgrazing are the main management needs. This association is suited to range. The major soils generally are unsuited to cultivated crops and to tame pasture and hay because of the salinity and flooding.

Gently Sloping to Steep, Clayey and Loamy Soils on Uplands

These soils dominantly are strongly sloping to steep but are less sloping in places. They make up about 15 percent of the survey area. About 92 percent of the acreage is range.

10. Betts-Java Association

Deep, well drained, strongly sloping to steep, loamy soils on uplands

This association dominantly is on ridges, hills, and the sides of drainageways. Slopes dominantly are strongly sloping or moderately steep but are steep in some areas. The drainage pattern is well defined.

This association makes up about 1 percent of the survey area. It is about 35 percent Betts soils, 30 percent Java soils, and 35 percent minor soils.

The Betts soils are on ridges, knolls, and the upper side slopes. Slopes range from 9 to 40 percent. Typically, the surface layer is dark grayish brown, calcareous loam. The next layer is light brownish gray, calcareous clay loam. The underlying material is grayish brown and light yellowish brown, calcareous clay loam.

The Java soils are on side slopes. In this association they have a slope of 9 to 25 percent. Typically, the surface layer is dark grayish brown, calcareous loam. The subsoil is dark grayish brown and pale brown, calcareous loam. The underlying material is pale brown and light yellowish brown, calcareous loam and clay loam.

Minor in this association are the Bon, Glenham, Ree, and Schamber soils. Bon soils are stratified and are dark to a depth of more than 20 inches. They are on flood plains. Glenham and Ree soils are more than 10 inches deep to lime. Glenham soils are on the lower side slopes. Ree soils are on terraces. The excessively drained Schamber soils are on some ridges.

Nearly all of this association supports native grasses and is used for grazing. Controlling erosion and runoff is the main concern of management. This association is suited to range. It generally is unsuited to cultivated crops and to tame pasture and hay. Many areas are potential sites for stock water impoundments.

11. Sansarc-Opal-Chantier Association

Shallow and moderately deep, well drained, gently sloping to steep, clayey soils on uplands

This association is on uplands characterized by steep slopes and deeply entrenched drainageways. The soils generally are strongly sloping to steep but are less

sloping on some side slopes. The drainage pattern is well defined.

This association makes up about 13 percent of the survey area. It is about 30 percent Sansarc soils, 25 percent Opal soils, 15 percent Chantier soils, and 30 percent minor soils (fig. 4).

The shallow Sansarc soils are on knolls and ridges. Slopes range from 6 to 40 percent. Typically, the surface layer is grayish brown clay. The underlying material is light brownish gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

The moderately deep Opal soils generally are on the lower side slopes. In this association they have a slope of 2 to 25 percent. Typically, the surface layer is gray clay. The subsoil is grayish brown clay. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay. It has accumulations of carbonate throughout. Light gray shale bedrock is at a depth of about 37 inches.

The shallow Chantier soils generally are on the less sloping parts of the landscape. Slopes range from 2 to 15 percent. Typically, the surface layer and the subsoil are grayish brown, calcareous clay. The underlying material is grayish brown, calcareous shaly clay. It has accumulations of lime and visible salts throughout. Light brownish gray, calcareous shale bedrock is at a depth of about 17 inches.

Minor in this association are the Betts, Bullcreek, Gettys, Java, McClure, Promise, Sully, Uly, and Wendte

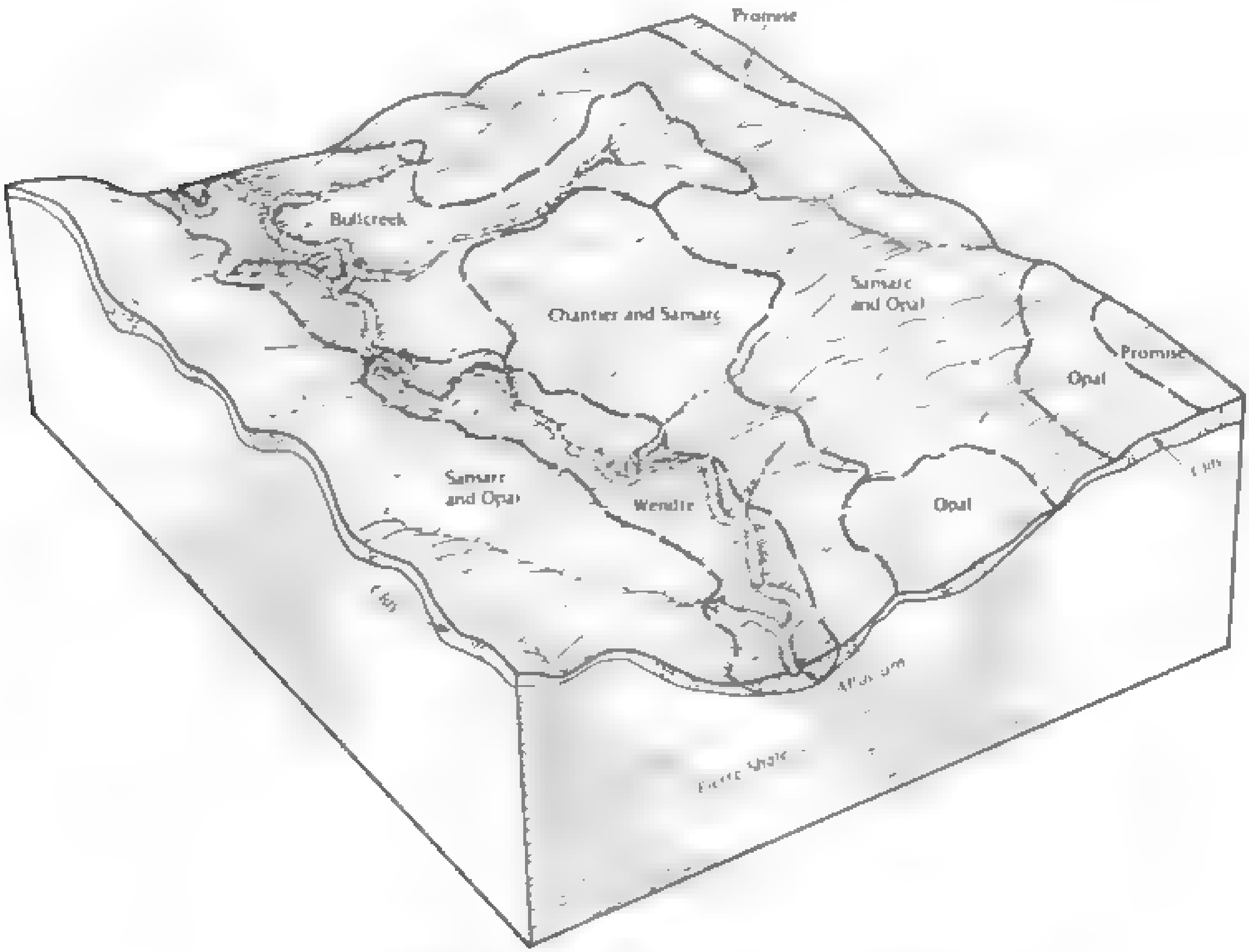

Figure 4.—Pattern of soils and parent material in the Sansarc-Opal-Chantier association.

soils. The deep, loamy Betts, Gettys, and Java soils and the deep, silty McClure, Sully, and Uly soils are above the major soils on the landscape. The deep, clayey Bullcreek and Promise soils are on the lower, less sloping parts of the landscape. The stratified Wendte soils are on the narrow flood plains.

About 95 percent of this association supports native grasses and is used for grazing. Native hay is harvested in some areas. Controlling erosion and runoff is the main concern of management. This association is suited to range. It generally is unsuited to cultivated crops and to tame pasture and hay. Because of the slope and the unstable nature of the shale, landslides are common in the steeper areas.

12. Okaton Association

Shallow, well drained, moderately steep and steep, clayey soils on uplands

This association consists primarily of the area known as the Bijou Hills in the southern part of Brule County. The slopes generally are steep but are moderately steep in places. The drainage pattern is well defined.

This association makes up about 1 percent of the survey area. It is about 55 percent Okaton soils and 45 percent minor soils.

The Okaton soils have a slope of 15 to 40 percent. Typically, the surface layer is grayish brown, calcareous bouldery silty clay. The next layer is grayish brown and light yellowish brown, calcareous bouldery silty clay. The underlying material is light yellowish brown and light olive brown clay and shaly clay. Light brownish gray and pale yellow, calcareous shale bedrock is at a depth of about 16 inches.

Minor in this association are the Millboro, Opal, Plankinton, Ree, and Uly soils. The deep Millboro and moderately deep Opal soils are on the lower, less sloping parts of the landscape. The deep, loamy Ree soils and the deep, silty Uly soils are on the top of buttes. The poorly drained Plankinton soils are in depressions.

About 75 percent of this association supports native grasses and is used for grazing; however, many of the minor soils are cultivated or used for tame pasture and hay. Controlling erosion and runoff is the main concern of management. This association is suited to range. It generally is unsuited to cultivated crops and to tame pasture and hay because of the slope, boulders, and shallow depth to shale.

Nearly Level to Strongly Sloping, Clayey Soils on Uplands

These soils dominantly are gently sloping and moderately sloping but are nearly level in some areas and strongly sloping in others. They make up about 14 percent of the survey area. About 60 percent of the acreage is range. Small grain, sorghum, and alfalfa are the main cultivated crops.

13. Opal, saline-Promise Association

Moderately deep and deep, well drained, nearly level to strongly sloping, clayey soils that are dominantly saline; on uplands

This association is on uplands characterized by smooth slopes. The soils generally are nearly level and undulating but are moderately sloping and strongly sloping in some areas. The drainage pattern is well defined.

This association makes up about 6 percent of the survey area. It is about 60 percent Opal soils, 30 percent Promise soils, and 10 percent minor soils.

The moderately deep, saline Opal soils are on convex slopes. In this association they have a slope of 1 to 11 percent. Typically, the surface layer is dark grayish brown clay. The subsoil is dark grayish brown clay. In the lower part it is calcareous and has accumulations of salts. The underlying material is light brownish gray mottled, calcareous clay. It has accumulations of lime throughout. Light gray [illegible] bedrock is at a depth of about 37 inches.

The deep Promise soils generally are on gentle slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silty clay. The subsoil is dark grayish brown and grayish brown clay. It is calcareous in the lower part. The underlying material is grayish brown and light brownish gray, calcareous clay.

Minor in this association are the moderately well drained Carter and Wendte soils and the shallow Sansarc soils. Carter soils are on flats. Sansarc soils are on the steeper parts of the landscape. Wendte soils are on narrow flood plains.

Most of this association supports native grasses and is used for grazing or hay. Some areas are used for alfalfa, wheat, and sorghum. Conserving moisture, controlling erosion, and improving tilth are the main concerns in managing cultivated areas. This association is suited to range, cultivated crops, and tame pasture and hay.

14. Promise-Opal Association

Deep and moderately deep, well drained, nearly level to strongly sloping, clayey soils on uplands

This association is on uplands characterized by long, smooth slopes. The soils generally are nearly level and gently sloping but are strongly sloping in some areas. The drainage pattern is well defined.

This association makes up about 8 percent of the survey area. It is about 50 percent Promise soils, 30 percent Opal soils, and 20 percent minor soils.

The deep Promise soils generally are on flats and gentle slopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silty clay. The

subsoil is dark grayish brown and grayish brown clay. It is calcareous in the lower part. The underlying material is grayish brown and light brownish gray, calcareous clay.

The moderately deep Opal soils are on convex slopes. In this association they have a slope of 6 to 11 percent. Typically, the surface layer is gray silty clay. The subsoil is grayish brown clay. It is calcareous in the lower part. The underlying material is light brownish gray, calcareous clay. Light gray shale bedrock is at a depth of about 37 inches.

Minor in this association are the moderately well drained Carter and Wendte soils, the sodium affected Hurley soils, the poorly drained Kolls soils, and the shallow Sansarc soils. Carter and Hurley soils are on flats. Kolls soils are in depressions. Sansarc soils are on the steeper parts of the landscape. Wendte soils are on narrow flood plains.

About 60 percent of this association is used for cultivated crops and tame pasture and hay. Alfalfa, sorghum, and wheat are the main crops, but some corn also is grown. Some areas support native grasses and are used for grazing or hay. Conserving moisture, controlling erosion, and improving tilth are the main concerns in managing cultivated areas. This association is suited to range, tame pasture and hay, and cultivated crops.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Glenham loam, 0 to 3 percent slopes, is one of several phases in the Glenham series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Carter-Promise complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

The names of some map units identified on the detailed soil maps of this survey area do not fully agree with those identified on the maps in the published surveys of Aurora, Charles Mix, and Hand Counties, South Dakota. Differences are the result of variations in the design and composition of map units or changes and refinements in series concepts.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

Ar—Artesian silty clay loam. This deep, somewhat poorly drained, level soil is in basins adjacent to Red Lake. It is subject to rare flooding. Areas are 50 to 150 acres in size and are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark gray silty clay loam about 5 inches thick. The subsoil is dark gray and gray, mottled, very firm silty clay about 26 inches thick. In the lower part it is calcareous and has accumulations of lime and salts. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous silty clay and silty clay loam. It has nests of salts in the upper part and has accumulations of carbonate throughout. In places the surface layer is silty clay.

Included with this soil in mapping are small areas of Bon and Worthing soils. These soils make up less than 20 percent of any one mapped area. The moderately well drained Bon soils are on the slightly higher parts of the landscape near the edge of the mapped areas. The very poorly drained Worthing soils are in depressions.

Fertility and the content of organic matter are high in the Artesian soil. Tilth is poor. Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is at a depth of 3 to 6 feet. Runoff is slow. The shrink-swell potential is very high.

About half of the acreage is cropland. This soil is suited to cultivated crops. Measures that improve tilth, increase the rate of water intake, and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and

legumes in the cropping system. Chiseling and subsoiling help to break up the dense subsoil and thus increase the rate of water intake. The wetness caused by flooding and the seasonal high water table delays fieldwork in some years. Surface drains help to remove excess water after heavy rains.

This soil is suited to tame pasture and hay. Alfalfa, Garrison creeping foxtail, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants. The surface soil compacts and the grass stands deteriorate if the pasture is grazed when wet. Deferred grazing during wet periods helps to prevent puddling.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant moisture supply grow especially well.

The capability unit is IIIw-3; Subirrigated range site.

BeB—Beadle loam, 2 to 6 percent slopes. This deep, well drained, undulating soil is on uplands. In places scattered stones are on the surface and throughout the soil. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes are short and convex.

Typically, the surface layer is dark gray loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, firm clay loam about 17 inches thick. In the lower part it is calcareous and mottled and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In some areas the depth to lime is less than 12 inches. In other areas the subsoil contains less clay. In places the surface layer is silt loam.

Included with this soil in mapping are small areas of DeGrey, Eakin, Highmore, Jerauld, and Mobridge soils. These soils make up less than 20 percent of any one mapped area. DeGrey and Jerauld soils have a sodium affected subsoil. They are in small pits and depressions. Eakin and Highmore soils contain less clay and sand in the subsoil than the Beadle soil. They are on the smooth parts of the landscape. The moderately well drained Mobridge soils are in swales.

Fertility is medium and the content of organic matter moderate in the Beadle soil. Tilth is fair. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture, help to control erosion, and improve tilth are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling and subsoiling improve tilth and increase the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-3; Clayey range site.

BeC—Beadle loam, 6 to 9 percent slopes. This deep, well drained, gently rolling soil is on uplands. In places scattered stones are on the surface and throughout the soil. Areas are 10 to 200 acres in size and are irregular in shape. Slopes are mostly convex.

Typically, the surface layer is dark gray loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, firm clay loam about 17 inches thick. In the lower part it is calcareous and mottled and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In places the depth to lime is less than 12 inches. In some places the subsoil contains less clay. In other places the surface layer is silt loam.

Included with this soil in mapping are small areas of DeGrey, Eakin, Highmore, Jerauld, and Mobridge soils. These soils make up less than 25 percent of any one mapped area. DeGrey and Jerauld soils have a sodium affected subsoil. They are in small pits and depressions. Eakin and Highmore soils contain less clay and sand in the subsoil than the Beadle soil. They are on the smooth parts of the landscape. The moderately well drained Mobridge soils are in swales.

Fertility is medium and the content of organic matter moderate in the Beadle soil. Tilth is fair. Available water capacity is high. Permeability is moderately slow. Runoff is medium. The shrink-swell potential is high in the subsoil.

Most of the acreage supports native grasses and is used for grazing and hay. No major hazards or limitations affect the use of this soil for range. Water erosion is a hazard, however, if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent the formation of gullies.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Chiseling and subsoiling improve tilth and increase the rate of water intake. Contour farming, grassed waterways, and terraces help to control water erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

This soil is suited to windbreaks and environmental plantings. It takes in water slowly, however, and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-7, Clayey range site.

BgB—Beadle-Jerauld complex, 1 to 5 percent slopes. These deep, gently sloping and undulating soils are on uplands. The well drained Beadle soil is on convex slopes. In places a few scattered stones and small glacial boulders are on the surface. The somewhat poorly drained Jerauld soil is on side slopes and in swales. Areas are 10 to more than 200 acres in size and are irregular in shape. They are 45 to 55 percent Beadle soil and 20 to 30 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Beadle soil is dark gray loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, firm clay loam about 17 inches thick. In the lower part it is calcareous and mottled and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In some areas the depth to lime is less than 12 inches. In other areas the subsoil contains less clay. In places the surface layer is silt loam.

Typically, the surface layer of the Jerauld soil is grayish brown silt loam about 2 inches thick. The subsoil is dark grayish brown, dark gray, and grayish brown, very firm and firm clay loam about 12 inches thick. It is calcareous and has visible salts and accumulations of lime in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has visible salts in the upper part. It is mottled in the lower part. It has accumulations of lime throughout.

Included with these soils in mapping are small areas of DeGrey, Eakin, Highmore, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. DeGrey soils have visible salts below a depth of 16 inches. They are on low mounds. The silty Eakin and Highmore soils do not have a sodium affected subsoil. They are in positions on the landscape similar to those of the Beadle soil. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Beadle soil. Fertility and the content of the organic matter are low in the Jerauld soil. The Jerauld soil has a sodium affected subsoil. Tilth is fair in the Beadle soil and poor in the Jerauld soil. Available water capacity is high in the Beadle soil and low or moderate in the Jerauld soil. Permeability is moderately slow in the Beadle soil and slow in the Jerauld soil. Runoff is medium on the Beadle soil and slow on the Jerauld soil. The shrink-swell potential is high in the subsoil of both soils.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in areas of the Jerauld soil. Restricted grazing during wet periods helps to prevent surface compaction and the deterioration of tilth.

This map unit is suited to tame pasture and hay, but very little production can be expected on the Jerauld soil. Alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass are suitable pasture plants for the Beadle soil. No pasture plants grow well on the Jerauld soil because the sodium affected subsoil restricts root development.

These soils are suited to cultivated crops, but crop growth is severely restricted on the Jerauld soil. Because the Jerauld soil occurs in a random pattern throughout the map unit, it is cropped with the Beadle soil. The dense claypan subsoil near the surface and the salts in the subsoil severely restrict root penetration and the rate of water intake in the Jerauld soil. Tilling when the soils are wet causes compaction of the subsoil. Measures that improve tilth, conserve moisture, and control erosion are the main management needs. Examples are minimizing tillage, applying animal manure, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling or chiseling improves tilth and increases the rate of water intake for a short time.

The Beadle soil is suited to windbreaks and environmental plantings, but it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established on the Beadle soil, but optimum growth is unlikely. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil.

The Beadle soil is in capability unit IIe-3, Clayey range site; the Jerauld soil is in capability unit VIs-1, Thin Claypan range site.

BmF—Betts-Java loams, 20 to 40 percent slopes. These deep, well drained, moderately steep and steep soils are on uplands that generally are dissected by small drainageways. The Betts soil is on ridges and the upper side slopes. The Java soil is on the less sloping

lower side slopes. Areas are 80 to several hundred acres in size and irregular in shape. They are 40 to 50 percent Betts soil and 30 to 40 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical. In most areas scattered glacial boulders and stones are on the surface and throughout the soils.

Typically, the surface layer of the Betts soil is dark grayish brown, calcareous loam about 3 inches thick. The next layer is light brownish gray, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous clay loam. Accumulations of lime are throughout the transitional layer and upper part of the underlying material. Nests of gypsum and mottles are in the lower part. In places the soil contains more clay throughout.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, calcareous loam and clay loam.

Included with these soils in mapping are small areas of Bon, Glenham, Okaton, Sansarc, Schamber, and Sully soils. These included soils make up less than 25 percent of any one mapped area. The moderately well drained Bon soils are on narrow flood plains. Glenham soils are more than 14 inches deep to lime. They are on the gently sloping parts of the landscape. The clayey Okaton and Sansarc soils are underlain by shale within a depth of 20 inches. They are lower on the landscape than the Betts and Java soils. Schamber soils are on knolls and ridges. They are less than 10 inches deep to gravelly material. Sully soils formed in silty loess. They are on some of the upper slopes along the Missouri River.

Fertility and the content of organic matter are low in the Betts and Java soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Runoff is rapid. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing or hay. These moderately steep and steep soils are subject to water erosion unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water impoundments.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Betts soil is in capability unit VIIe-3, Thin Upland range site; the Java soil is in capability unit VIe-3, Silty range site.

Bn—Bon loam. This deep, well drained, nearly level soil is on flood plains. It is subject to rare flooding for brief periods. Areas are 15 to 160 acres in size and are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown loam about 14 inches thick. The subsurface layer is grayish brown and dark gray, very friable, calcareous loam about 14 inches thick. It has accumulations of lime throughout. The underlying material to a depth of 60 inches is pale brown and light brownish gray, stratified, calcareous clay loam and silty clay loam. In places the subsurface layer is not so dark.

Included with this soil in mapping are small areas of Durrstein, Egas, Farmsworth, Lane, Oahe, and Ree soils. These soils make up less than 20 percent of any one mapped area. The poorly drained Durrstein and Egas soils are on the low parts of the flood plains. Farmsworth and Lane soils are in positions on the landscape similar to those of the Bon soils. Farmsworth soils have a sodium affected subsoil. Lane soils contain more clay in the control section than the Bon soil. Oahe and Ree soils are on terraces. Oahe soils are underlain by gravelly material at a depth of 20 to 40 inches. Ree soils are dark to a depth of less than 20 inches.

Fertility and the content of organic matter are high in the Bon soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Floodwater delays planting in some years, but in most years the additional moisture is beneficial and flood damage is minor.

No major hazards or limitations affect the use of this soil for range. Although the soil is subject to brief flooding, the additional moisture is beneficial.

This soil is suited to windbreaks and environmental plantings. The trees and shrubs that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3, Overflow range site.

Bo—Bon loam, channeled. This deep, moderately well drained and well drained, nearly level soil is on flood plains that are dissected into many small tracts by narrow channels and partly filled old stream meanders. The soil is occasionally [redacted] adjacent to the channel and is subject to rare flooding on the high parts of the flood plain. Areas are 15 to more than 100 acres in size and are long and narrow.

Typically, the surface layer is dark grayish brown loam about 14 inches thick. The subsurface layer is grayish brown and dark gray, very friable, calcareous loam about

14 inches thick. It has accumulations of lime throughout. The underlying material to a depth of 60 inches is pale brown and light brownish gray, stratified, calcareous clay loam and silty clay loam.

Included with this soil in mapping are small areas of Oahe, Ree, and Wendte soils. These soils make up less than 20 percent of any one mapped area. The well drained Oahe and Ree soils are on terraces. Oahe soils are underlain by gravelly material at a depth of 20 to 40 inches. Ree soils are dark to a depth of less than 20 inches. Wendte soils contain more clay throughout than the Bon soils. They are in positions on the landscape similar to those of the Bon soil.

Fertility and the content of organic matter are high in the Bon soil. Tilth is good. Available water capacity is high. Permeability is moderate. A seasonal high water table is at a depth of 2 to 6 feet near the channels. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range. Although the soil is frequently flooded in places, the additional water is beneficial. Pools of water in some areas of the channels provide temporary watering places for livestock and wildlife.

This soil generally is unsuited to cultivated crops because it is dissected into small tracts and is subject to flooding in the spring. It is suited to tame pasture and hay, but harvesting hay is difficult because of the channeled landscape. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. They can be planted by hand. Because of the meandering stream channels, however, they generally cannot be planted by machine.

The capability unit is VIw-1, Overflow range site (rarely flooded areas), Subirrigated range site (occasionally flooded areas).

Bu—Bullcreek clay. This deep, moderately well drained, nearly level and gently sloping soil is on low terraces and fans. Areas are 30 to more than 200 acres in size and are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is grayish brown clay about 2 inches thick. The subsoil is gray and grayish brown, firm clay about 22 inches thick. It has visible salts in the lower part. The underlying material to a depth of 60 inches is grayish brown clay. It has visible salts in the upper part.

Included with this soil in mapping are small areas of Hurley, Opal, and Promise soils and areas of Slickspots. These soils make up less than 20 percent of any one mapped area. Hurley soils have a sodium affected subsoil. They are in positions on the landscape similar to those of the Bullcreek soil. Opal and Promise soils are slightly higher on the landscape than the Bullcreek soil. Also, they are not so dense, and Promise soils have fewer salts throughout. Opal soils are 20 to 40 inches deep to shale. Slickspots have no plant cover. They are in slight depressions.

Fertility is low and the content of organic matter moderate in the Bullcreek soil. Tilth is very poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the very poor tilth and the high content of salts.

The capability unit is VIs-5, Dense Clay range site.

Ca—Carter silt loam. This deep, moderately well drained, nearly level soil is on uplands and terraces. Areas are 20 to more than 200 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface layer is gray silt loam about 4 inches thick. The subsoil is about 14 inches thick. It is dark gray, very firm silty clay in the upper part, dark grayish brown, very firm clay in the next part, and grayish brown, very firm, calcareous clay in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light olive gray, calcareous clay. It has accumulations of lime throughout. In places the subsoil contains more sodium.

Included with this soil in mapping are small areas of Bullcreek, Dorna, and Promise soils. These soils make up less than 25 percent of any one mapped area. They are in positions on the landscape similar to those of the Carter soil. The clayey Bullcreek and Promise soils do not have columnar structure in the subsoil. The silty Dorna soils do not have a claypan subsoil.

Fertility is low and the content of organic matter moderate in the Carter soil. Root penetration is restricted by the dense claypan subsoil. Tilth is poor. Available water capacity is low or moderate. Permeability is very slow. Runoff is low. The shrink swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil is suited to tame pasture and hay, but the choice of suitable pasture plants and productivity are limited by the dense claypan subsoil. Only those species that can grow in a soil that has a claypan subsoil are suitable. Examples are alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and

western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The claypan subsoil restricts water intake and the penetration of plant roots.

The capability unit is VIs-1; Thin Claypan range site.

Cp—Carter-Promise complex. These deep, gently undulating soils are on uplands. The moderately well drained Carter soil is in broad swales, in small, shallow depressions, and on long, smooth slopes. The well drained Promise soil is on slight rises. Areas are 20 to 500 acres in size and are irregular in shape. They are 55 to 65 percent Carter soil and 30 to 40 percent Promise soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Carter soil is gray silt loam about 4 inches thick. The subsoil is about 14 inches thick. It is dark gray, very firm silty clay in the upper part, dark grayish brown, very firm clay in the next part, and grayish brown, very firm, calcareous clay in the lower part. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light olive gray, calcareous clay. It has accumulations of lime throughout. In places the subsoil contains more sodium.

Typically, the surface layer of the Promise soil is dark gray silty clay about 7 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay. It is mottled in the lower part. In some places shale bedrock is at a depth of 20 to 40 inches. In other places visible salts are in the lower part of the subsoil.

Included with these soils in mapping are small areas of Bullcreek soils. These included soils make up less than 10 percent of any one mapped area. They do not have columnar structure in the subsoil and are more dense than the Promise soil.

Fertility is low in the Carter soil and medium in the Promise soil. The content of organic matter is moderate in both soils. Root penetration is restricted by the dense claypan subsoil in the Carter soil. Tilth is poor in both soils. Available water capacity is low or moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem on both soils. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

These soils are suited to tame pasture and hay, but only those species that can grow in a soil that has a claypan subsoil are suited to the Carter soil. Examples are alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

This map unit generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The dense claypan subsoil in the Carter soil restricts root penetration.

The Carter soil is in capability unit VIs-1, Thin Claypan range site, the Promise soil is in capability unit IIIs-3, Clayey range site.

Cr—Cavo-Jerauld silt loams. These deep, nearly level and gently undulating soils are on uplands. The moderately well drained Cavo soil is on slight rises. The somewhat poorly drained Jerauld soil is in small pits and depressions. Areas are 10 to 600 acres in size and are irregular in shape. They are 55 to 65 percent Cavo soil and 15 to 25 percent Jerauld soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Cavo soil is dark gray silt loam about 4 inches thick. The subsurface layer is gray loam about 4 inches thick. The subsoil is dark gray, dark grayish brown, and grayish brown, firm clay loam about 19 inches thick. In the lower part it is calcareous and has accumulations of lime and salts that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay loam. It is mottled in the lower part. In some areas the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Jerauld soil is grayish brown silt loam about 2 inches thick. The subsoil is dark grayish brown, dark gray, and grayish brown, very firm and firm clay loam about 12 inches thick. In the lower part it is calcareous and has visible salts and accumulations of lime. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has accumulations of lime throughout and visible salts in the upper part. It is mottled in the lower part.

Included with these soils in mapping are small areas of Beadle and Eakin soils. These included soils make up less than 20 percent of any one mapped area. They do not have a sodium affected subsoil. They are on the higher parts of the landscape.

Fertility is low in the Cavo and Jerauld soils. The content of organic matter is moderate in the Cavo soil and low in the Jerauld soil. Both soils contain a detrimental amount of sodium. Tilth is poor. Available water capacity is moderate or high in the Cavo soil and low or moderate in the Jerauld soil. Permeability is slow in both soils. Runoff also is slow. The shrink-swell potential is high in the subsoil.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in

areas of the Jerauld soil. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This map unit is suited to cultivated crops, but the sodium affected subsoil in these soils severely limits their productivity. No crops grow well on the Jerauld soil. Tilling when the soil is wet causes compaction of the subsoil. Early maturing small grain is better suited than row crops. Measures that improve tilth and conserve moisture are the main management needs. Examples are minimizing tillage, applying animal manure, chiseling or subsoiling, and leaving crop residue on the surface.

This map unit is suited to tame pasture and hay, but very little production can be expected on the Jerauld soil. Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are the best suited species.

The Cavo soil is suited to windbreaks and environmental plantings, but the dense claypan subsoil severely limits root penetration. Trees and shrubs can be established on the Cavo soil, but optimum growth, survival, and vigor are unlikely. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil.

The Cavo soil is in capability unit IVs-2, Claypan range site; the Jerauld soil is in capability unit VIs-1, Thin Claypan range site.

CsD—Chantier-Sansarc clays, 2 to 15 percent slopes. These shallow, well drained, gently sloping to strongly sloping soils are on uplands that generally are dissected by drainageways. The Chantier soil is on the smoother, less sloping parts of the landscape. The Sansarc soil is on the steeper side slopes and ridges. Areas are 50 to several hundred acres in size and are irregular in shape. They are about 60 to 70 percent Chantier soil and 20 to 30 percent Sansarc soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Chantier soil is grayish brown, calcareous clay about 3 inches thick. The subsoil is grayish brown, extremely firm, calcareous clay about 5 inches thick. The underlying material is grayish brown, calcareous shaly clay. It has accumulations of lime and visible salts. Light brownish gray, calcareous shale bedrock is at a depth of about 17 inches. In places the depth to shale is more than 20 inches.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

Included with these soils in mapping are small areas of Bullcreek and Opal soils and Slickspots. These included soils and Slickspots make up less than 20 percent of any one mapped area. Bullcreek soils and Slickspots are on foot slopes and along drainageways. Bullcreek soils are more than 40 inches deep to shale. Slickspots have a puddled surface and support little or no vegetation. Opal soils are 20 to 40 inches deep to shale. They are in positions on the landscape similar to those of the Chantier soil.

Fertility and the content of organic matter are low in the Chantier and Sansarc soils. The Chantier soil contains a detrimental amount of salts. Tilth is poor in both soils. Available water capacity is very low. Permeability is very slow in the Chantier soil and slow in the Sansarc soil. Runoff is medium on the Chantier soil and rapid on the Sansarc soil. The shrink-swell potential is very high in both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying. Reestablishing vegetation is difficult in denuded areas.

These soils generally are too droughty for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The accumulations of salts in the Chantier soil are an additional limitation.

The Chantier soil is in capability unit VIs-5, Dense Clay range site; the Sansarc soil is in capability unit VIe-12, Shallow Clay range site.

DaA—DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes. These deep, nearly level soils are on uplands. The moderately well drained DeGrey soil is in shallow depressions. The well drained Eakin soil is on slight rises. A few scattered stones are on the surface in some areas. The somewhat poorly drained Jerauld soil is in small pits and depressions. Areas are 10 to 150 acres in size and are irregular in shape. They are about 30 to 40 percent DeGrey soil, 20 to 30 percent Eakin soil, and 15 to 25 percent Jerauld soil. The three soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 15 inches thick. It is dark grayish brown, very firm silty clay and grayish brown, firm, calcareous silty clay loam. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light brownish gray calcareous silty clay loam and clay loam. It has visible salts throughout. It is mottled in the lower part.

Typically, the surface layer of the Eakin soil is dark grayish brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown and grayish brown, friable silty clay loam in the upper part and light yellowish brown, very friable, mottled calcareous silt loam in the lower part. In the lower part it has accumulations of lime that extend into the underlying

material. The underlying material to a depth of 60 inches is grayish brown, mottled, calcareous clay loam. In some places the clay loam glacial till is at a depth of more than 40 inches. In other places loamy glacial till is within a depth of 20 inches.

Typically, the surface layer of the Jerauld soil is grayish brown silt loam about 2 inches thick. The subsoil is dark grayish brown, dark gray, and grayish brown, very firm and firm clay loam about 12 inches thick. In the lower part it is calcareous and has visible salts and accumulations of lime. The underlying material to a depth of 60 inches is grayish brown, light brownish gray, and light yellowish brown, calcareous clay loam. It has visible salts in the upper part and accumulations of lime throughout. It is mottled in the lower part.

Included with these soils in mapping are small areas of Beadle, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. They do not have a sodium affected subsoil. Beadle soils contain more clay in the subsoil than the Eakin soil. They are in positions on the landscape similar to those of the Eakin soil. The moderately well drained Mobridge soils are dark to a depth of more than 20 inches. They are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is low in the DeGrey and Jerauld soils. It is medium in the Eakin soil. The content of organic matter is moderate in the DeGrey and Eakin soils and low in the Jerauld soil. The DeGrey and Jerauld soils have a sodium affected subsoil that contains a detrimental amount of sodium salts. Tilth is poor in the DeGrey and Jerauld soils. It is good in the Eakin soil. Available water capacity is moderate or high in the DeGrey soil, high in the Eakin soil, and low or moderate in the Jerauld soil. Permeability is slow in the DeGrey and Jerauld soils. It is moderate in the upper part of the Eakin soil and moderately slow in the lower part. Runoff is slow on all three soils. The shrink-swell potential is moderate in the Eakin soil and high in the subsoil of the DeGrey and Jerauld soils.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem in areas of the Jerauld soil. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

These soils are suited to tame pasture and hay, but little production can be expected on the Jerauld soil. Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are examples of suitable pasture plants that can be grown on the Eakin and DeGrey soils. No pasture plants grow well on the Jerauld soil.

This map unit is suited to cultivated crops, but the sodium affected subsoil in the DeGrey and Jerauld soils severely limits their productivity. Early maturing small grain is better suited than row crops. Tilling when the soil is wet causes compaction of the subsoil in the DeGrey and Jerauld soils. Measures that conserve moisture and improve tilth are the main management needs. Examples are minimizing tillage and leaving crop residue on the surface. Including grasses and legumes in the cropping system and subsoiling or chiseling improve tilth and increase the rate of water intake.

The DeGrey and Eakin soils are suited to windbreaks and environmental plantings, but the dense claypan subsoil in the DeGrey soil severely limits root penetration. The Jerauld soil generally is unsuited to windbreaks and environmental plantings. No trees or shrubs grow well on this soil. Windbreaks can be established on the DeGrey and Jerauld soils, but optimum growth is unlikely.

The DeGrey soil is in capability unit IVs-2, Claypan range site; the Eakin soil is in capability unit IIc-2, Silty range site; the Jerauld soil is in capability unit VIs-1, Thin Claypan range site.

DeD—Delmont loam, 6 to 15 percent slopes. This somewhat excessively drained, gently rolling and rolling soil is on terrace remnants. It is shallow over sandy and gravelly material. In some areas scattered stones are on the surface. Areas are 10 to 100 acres in size and are irregular in shape. Slopes generally are short and convex.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark gray, friable, calcareous loam about 12 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. It has accumulations of lime in the upper part. In some places the gravelly sand is at a depth of more than 20 inches or within a depth of 14 inches.

Included with this soil in mapping are small areas of Java and Ree soils. These soils make up less than 20 percent of any one mapped area. They do not have gravelly material within a depth of 40 inches. Java soils are in positions on the landscape similar to those of the Delmont soil. Ree soils generally are on the less sloping parts of the landscape.

Fertility is medium and the content of organic matter moderate in the Delmont soil. Tilth is good. Available water capacity is low. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing. Productivity is limited because the soil is droughty. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This soil is suited to tame pasture and hay, but productivity is limited because of droughtiness. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and pubescent wheatgrass.

This soil generally is unsuited to cultivated crops because it is droughty. It is suited to windbreaks and environmental plantings, but droughtiness is a limitation. Trees and shrubs can be established, but optimum growth and survival are unlikely. Planting on the contour helps to control erosion.

This soil is a probable source of sand and gravel.

The capability unit is VIe-5; Shallow to Gravel range site.

Do—Dorna silt loam. This deep, well drained, nearly level and very gently sloping soil is on uplands. Areas are 20 to 100 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is grayish brown silt loam about 5 inches thick. The subsurface layer also is grayish brown silt loam. It is about 12 inches thick. It is calcareous in the lower part. The upper part of the underlying material is brown and grayish brown, calcareous silt loam. The lower part to a depth of 60 inches is grayish brown, light brownish gray, and olive, calcareous silty clay loam and silty clay. In some places silty clay loam or silty clay is at a depth of 12 to 20 inches. In other places the depth to clayey material is more than 40 inches.

Included with this soil in mapping are small areas of the clayey Millboro and Promise soils. These soils make up less than 20 percent of any one mapped area. They contain more clay in the subsoil than the Dorna soil. They are in positions on the landscape similar to those of the Dorna soil.

Fertility is medium and the content of organic matter moderate in the Dorna soil. Tilth is good. Available water capacity is moderate or high. Permeability is moderate in the upper part of the soil and slow in the lower part. Runoff is slow. The shrink-swell potential is low in the upper part of the soil and high in the lower part.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control wind erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, minimizing tillage, stripcropping, and establishing field windbreaks.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIe-1; Silty range site.

Du—Durrstein silt loam. This deep, poorly drained, level soil is on flood plains along some of the larger drainageways. It is occasionally flooded for brief periods. Areas are 50 to several hundred acres in size and are irregular in shape. Slopes are long and smooth and are characterized by slight microrelief.

Typically, the surface layer is gray silt loam about 1 inch thick. The subsoil is dark gray and gray, very firm silty clay about 18 inches thick. In the lower part it is calcareous and has visible salts and accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is gray, calcareous silty clay. It has accumulations of lime and nests of gypsum and other salts.

Included with this soil in mapping are small areas of Egas, Egas Variant, and Lane soils and Slickspots. These soils make up less than 20 percent of any one mapped area. Egas soils are shallower to visible salts than the Durrstein soil. They are in positions on the landscape similar to those of the Durrstein soil. Egas Variant soils are calcareous near the surface. They are slightly lower on the landscape than the Durrstein soil. The moderately well drained Lane soils are on the slightly higher parts of the landscape. Slickspots have a puddled surface and do not support vegetation. They are in small pits and depressions.

Fertility and the content of organic matter are low in the Durrstein soil. This soil has a sodium affected subsoil that adversely affects the growth of most plants. Tilth is poor. Available water capacity is moderate. A seasonal high water table is within a depth of 1.5 feet. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of salts and compaction are problems. Salt-tolerant species should be favored. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is too wet and too saline for cultivated crops and windbreaks and environmental plantings. The dense claypan subsoil also is a limitation. The soil is suited to tame pasture and hay, but the choice of pasture plants is limited by the wetness and the high degree of salinity. Examples of suitable pasture plants are tall wheatgrass and western wheatgrass.

The capability unit is VIw-4; Saline Lowland range site.

EaA—Eakin-DeGrey silt loams, 0 to 3 percent slopes. These deep, gently undulating soils are on uplands. The well drained Eakin soil is in convex areas. A few scattered stones commonly are on the surface. The moderately well drained DeGrey soil is in slightly concave areas. Areas are 20 to several hundred acres in size and are irregular in shape. They are 40 to 50 percent Eakin soil and 25 to 35 percent DeGrey soil. The

two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Eakin soil is dark grayish brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is dark grayish brown and grayish brown, friable silty clay loam in the upper part and light yellowish brown, very friable, mottled, calcareous silt loam in the lower part. The lower part has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, mottled, calcareous clay loam. In some places the clay loam glacial till is at a depth of more than 40 inches. In other places loamy glacial till is within a depth of 20 inches.

Typically, the surface layer of the DeGrey soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 15 inches thick. It is dark grayish brown, very firm silty clay and grayish brown, firm, calcareous silty clay loam. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light brownish gray calcareous silty clay loam and clay loam. It has visible salts throughout. It is mottled in the lower part.

Included with these soils in mapping are small areas of Beadle, Java, Jerauld, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle soils contain more clay in the subsoil than the Eakin soil. They are on the low parts of the landscape. The loamy Java soils are on low mounds and ridges. Jerauld soils have visible salts within a depth of 16 inches. They are in small pits and depressions. The moderately well drained Mobridge soils are in swales. They do not have a sodium affected subsoil and are dark to a depth of more than 20 inches. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Eakin soil and low in the DeGrey soil. The content of organic matter is moderate in both soils. The sodium affected subsoil in the DeGrey soil adversely affects the growth of most plants. Tilth is good in the Eakin soil and poor in the DeGrey soil. Available water capacity is high in the Eakin soil and medium or high in the DeGrey soil. Permeability is moderate in the upper part of the Eakin soil and moderately slow in the lower part. It is slow in the DeGrey soil. Runoff is slow on both soils. The shrink-swell potential is moderate in the Eakin soil and high in the DeGrey soil.

About half of the acreage is cropland. These soils are suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and pubescent wheatgrass. The sodium affected subsoil in the DeGrey soil restricts root penetration and the rate of water intake. Tilling when the soil is wet causes compaction of the subsoil in the DeGrey soil. Measures that improve tilth and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, including grasses and legumes in the cropping system, and applying animal manure. Subsoiling or chiseling improves tilth and increases the rate of water intake.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings, but the sodium affected subsoil of the DeGrey soil limits root penetration. All climatically suited trees and shrubs grow well on the Eakin soil, except for those that require an abundant supply of moisture. Windbreaks and environmental plantings can be established on the DeGrey soil, but optimum growth, survival, and vigor are unlikely.

The Eakin soil is in capability unit IIc-2, Silty range site; the DeGrey soil is in capability unit IVs-2, Claypan range site.

Eg—Egas silty clay loam. This deep, poorly drained, level soil is on flood plains along some of the larger drainageways. It is occasionally flooded for brief periods. Areas are 100 to several hundred acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is gray silty clay loam about 1 inch thick. The subsurface layer is dark gray silty clay about 4 inches thick. The next layer is dark gray, very firm, calcareous silty clay about 8 inches thick. It has visible salts throughout. The underlying material to a depth of 60 inches is gray and light gray, calcareous silty clay and clay loam. It has visible salts throughout. It is mottled in the lower part.

Included with this soil in mapping are small areas of Durrstein, Egas Variant, and Lane soils and areas of Slickspots. These inclusions make up less than 20 percent of any one mapped area. Durrstein soils have a sodium affected subsoil. They are in positions on the landscape similar to those of the Egas soil. Egas Variant soils and Slickspots are in the low areas on the flood plains. Egas Variant soils are calcareous near the surface and are not so saline as the Egas soil. Slickspots have a puddled surface and support little or no vegetation. The moderately well drained Lane soils are slightly higher on the landscape than the Egas soil.

Fertility is low and the content of organic matter moderate in the Egas soil. This soil is very saline. Tilth is poor. Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is within a depth of 1 foot. Runoff is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of salts and compaction are problems. Salt-tolerant species should be favored. Restricted grazing during wet periods helps

to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of wetness, the flooding, and the high concentration of salts.

The capability unit is VIw-4; Saline Lowland range site.

Ew—Egas Variant silty clay loam. This deep, very poorly drained, level soil is on flood plains along some of the larger drainageways. It is frequently flooded or ponded. Areas are 20 to 250 acres in size and are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is dark gray, calcareous silty clay loam about 4 inches thick. The subsurface layer is gray, calcareous silty clay loam about 6 inches thick. The next layer is grayish brown, friable, calcareous silty clay loam about 10 inches thick. It has accumulations of lime and salts that extend into the underlying material. The underlying material to a depth of 60 inches is gray, calcareous silty clay loam.

Included with this soil in mapping are small areas of Durrstein and Egas soils. These soils make up less than 15 percent of any one mapped area. They are slightly higher on the flood plains than the Egas Variant soil. Durrstein soils have a sodium affected subsoil. Egas soils contain more salts and less lime than the Egas Variant soil.

Fertility is medium and the content of organic matter moderate in the Egas Variant soil. Available water capacity is moderate or high. Permeability is slow. A seasonal high water table is within a depth of 3 feet. As much as 1 foot of water ponds on the surface during some wet periods. Runoff is ponded.

Most of the acreage supports native grasses and is used for grazing or hay. An excess of salts, ponding, and compaction are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the ponding.

The capability unit is Vw-1; Wetland range site.

Fa—Farmsworth silt loam. This deep, somewhat poorly drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are 10 to more than 100 acres in size and are irregular in shape. Slopes are smooth or slightly concave.

Typically, the surface layer is gray silt loam about 5 inches thick. The subsurface layer is light gray silt loam about 3 inches thick. The subsoil is dark gray and dark grayish brown, very firm silty clay about 31 inches thick. In the lower part it is calcareous and has visible salts. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, mottled, calcareous silty clay loam. It has visible salts in the upper part.

Included with this soil in mapping are small areas of Bon, Durrstein, Egas, Lane, and Ree soils. These soils make up less than 25 percent of any one mapped area. Bon, Lane, and Ree soils do not have a sodium affected subsoil. They are slightly higher on the flood plains than the Farmsworth soil. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains.

Fertility is medium and the content of organic matter moderate in the Farmsworth soil. The sodium in this soil adversely affects the growth of most plants. Tilth is poor. Available water capacity is moderate or high. A seasonal high water table is at a depth of 3 to 6 feet. Permeability is slow or very slow. Runoff is slow. The shrink-swell potential is high in the subsoil.

About half of the acreage is cropland. This soil is suited to cultivated crops, but the sodium affected subsoil can restrict the penetration of plant roots. The best suited crops are those that are tolerant of drought and sodium salts. Early maturing small grain is better suited than corn. Tilling when the soil is wet causes compaction of the subsoil. Measures that improve tilth and conserve moisture are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling helps to break up the claypan subsoil and increases the rate of water intake for a short time.

This soil is suited to tame pasture and hay. Only those species that can grow in a soil that has a claypan subsoil and that contains sodium salts are suitable. Alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass are examples. Deferred grazing during wet periods helps to prevent surface compaction.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity. Many areas are potential sites for excavated ponds.

This soil is suited to windbreaks and environmental plantings, but the sodium affected subsoil severely limits root penetration. Optimum growth, survival, and vigor are unlikely.

The capability unit is IVs-2; Claypan range site.

GeE—Gettys clay loam, 9 to 25 percent slopes. This deep, well drained, strongly sloping and moderately steep soil is on uplands. A few stones commonly are on the surface. Areas are 50 to 200 acres in size and are irregular in shape. Slopes generally are convex.

Typically, the surface layer is grayish brown, calcareous clay loam about 2 inches thick. The next layer is grayish brown, friable, mottled, calcareous clay loam about 6 inches thick. It has accumulations of lime

that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam and clay. In some places the soil contains less clay. In other places shale bedrock is within a depth of 40 inches.

Included with this soil in mapping are small areas of Beadle, Lowry, and Sully soils. These soils make up less than 25 percent of any one mapped area. Beadle soils are more than 12 inches deep to lime. They are on the lower side slopes. The silty Lowry and Sully soils are in positions on the landscape similar to those of the Gettys soil.

Fertility and the content of organic matter are low in the Gettys soil. Available water capacity is moderate or high. Permeability is moderately slow. Runoff is rapid. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on this strongly sloping and moderately steep soil unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water impoundments.

This soil is suited to tame pasture and hay, but the choice of pasture plants and productivity are limited by the low fertility, the high content of lime, and a severe erosion hazard. The best suited pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil generally is too steep for cultivated crops and windbreaks and environmental plantings. Climatically suited trees and shrubs can be established for special purposes if they are planted by hand and given special care.

The capability unit is VIe-3, Thin Upland range site.

GeF—Gettys clay loam, 25 to 40 percent slopes. This deep, well drained, steep soil is on uplands. Small stones and cobbles are on the surface. Landslides occur in some areas. Areas are 60 to several hundred acres in size and are irregular in shape. Slopes generally are convex.

Typically, the surface layer is grayish brown, calcareous clay loam about 2 inches thick. The next layer is grayish brown, friable, mottled, calcareous clay loam about 6 inches thick. It has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam and clay. In some places the soil contains less clay. In other places shale bedrock is within a depth of 40 inches.

Included with this soil in mapping are small areas of Sansarc, Schamber, and Sully soils. These soils make up less than 25 percent of any one mapped area. The shallow, clayey Sansarc soils are lower on the landscape than the Gettys soil. Schamber soils are shallow to gravel. They are on knolls and ridges. The silty Sully soils are above the Gettys soil on the landscape.

Fertility and the content of organic matter are low in the Gettys soil. Available water capacity is moderate or high. Permeability is moderately slow. Runoff is rapid. The shrink-swell potential is high.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on this steep soil unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in draws are suitable sites for stock water impoundments.

This soil generally is too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-3, Thin Upland range site.

GhA—Glenham loam, 0 to 3 percent slopes. This deep, well drained, very gently sloping soil is on uplands. A few scattered stones commonly are on the surface. Areas are 10 to 80 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, brown, and light brownish gray, friable clay loam about 12 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, friable, calcareous clay loam. It is mottled in the lower part. In some places the subsoil contains less sand. In other places it contains more clay.

Included with this soil in mapping are small areas of DeGrey, Highmore, Java, Jerauld, Mobridge, and Plankinton soils. These soils make up less than 25 percent of any one mapped area. The sodium-affected DeGrey and Jerauld soils are in small depressions. Highmore soils contain less sand in the subsoil than the Glenham soil. They are in positions on the landscape similar to those of the Glenham soil. Java soils have lime within a depth of 10 inches. They are on knolls and ridges. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Glenham soil. Tilth is good. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is slow. The shrink-swell potential is moderate.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system are examples.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Silty range site.

GkB—Glenham-Java loams, 3 to 6 percent slopes. These deep, well drained, undulating soils are on uplands. The Glenham soil is on the smooth or slightly convex side slopes. The Java soil is on knolls and ridges. Scattered stones are common on the surface in some areas. Areas are 20 to more than 1,000 acres in size and are irregular in shape. They are 50 to 60 percent Glenham soil and 20 to 30 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Glenham soil is dark grayish brown, very friable loam about 4 inches thick. The subsoil is dark grayish brown, brown, and light brownish gray, friable clay loam about 12 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, friable, calcareous clay loam. It is mottled in the lower part. In some places the subsoil contains less sand. In other places it contains more clay.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam.

Included with these soils in mapping are small areas of DeGrey, Jerauld, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected DeGrey and Jerauld soils are on flats and in small depressions. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Glenham soil and low in the Java soil. The content of organic matter is moderate in the Glenham soil and low in the Java soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the subsoil and moderately slow in the underlying material. Runoff is medium. The shrink-swell potential is moderate.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management needs. Improving fertility also is a concern because the high content of lime in the surface layer of the Java soil adversely affects the availability of plant nutrients. Including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage help to control erosion, conserve moisture, and improve fertility. Applying animal manure also improves fertility. Contour farming, grassed waterways, and terraces can help to control erosion, but in some areas the slopes are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture, but the choice of pasture plants and productivity are limited on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings, but the high content of lime in the surface layer of the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Glenham soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The Glenham soil is in capability unit IIe-2, the Java soil in capability unit IIIe-12; both soils are in Silty range site.

HgB—Highmore-Java complex, 1 to 5 percent slopes. These deep, well drained, gently sloping and undulating soils are on uplands. The Highmore soil is on the smoother slopes. The Java soil is on the more convex slopes. Areas are 20 to several hundred acres in size and are irregular in shape. They are 50 to 70 percent Highmore soil and 20 to 40 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Highmore soil is dark grayish brown silt loam about 6 inches thick. The subsoil is dark brown and light yellowish brown, friable silty clay loam about 17 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The upper part of the underlying material is light yellowish brown, mottled, calcareous silty clay loam. The lower part to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In places the clay loam glacial till is at a depth of 20 to 40 inches.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown

friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam. In some places the subsoil contains more clay. In other places the surface layer is thinner.

Included with these soils in mapping are small areas of Beadle, DeGrey, Glenham, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle and Glenham soils are in positions on the landscape similar to those of the Highmore soil. They are deeper to lime than the Java soil. Also, Beadle soils contain more clay in the subsoil than the Highmore and Java soils. The sodium affected DeGrey soils are in small depressions. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and low in the Java soil. The content of organic matter is moderate in the Highmore soil and low in the Java soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of both soils and moderately slow in the lower part. Runoff is medium. The shrink-swell potential is moderate.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management needs. Improving fertility also is a concern because the high content of lime in the surface layer of the Java soil adversely affects the availability of plant nutrients. Including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage help to control erosion, conserve moisture, and improve fertility. Applying animal manure also improves fertility.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture and hay, but the choice of pasture plants and productivity are limited on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings, but the high content of lime in the surface layer of the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Highmore soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum growth, survival, and vigor are unlikely.

The Highmore soil is in capability unit IIe-1, the Java soil in capability unit IIIe-12; both soils are in Silty range site.

HgC—Highmore-Java complex, 5 to 9 percent slopes. These deep, well drained, undulating and gently rolling soils are on uplands. The Highmore soil is on the smooth slopes. The Java soil is on the convex parts of the landscape. Areas are 20 to 300 acres in size and are irregular in shape. They are 40 to 50 percent Highmore soil and 35 to 45 percent Java soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Highmore soil is dark grayish brown silt loam about 6 inches thick. The subsoil is dark brown and light yellowish brown, friable silty clay loam about 17 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The upper part of the underlying material is light yellowish brown, mottled, calcareous silty clay loam. The lower part to a depth of 60 inches is light brownish gray, mottled, calcareous clay loam. In places the clay loam glacial till is at a depth of 20 to 40 inches.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam. In some places the subsoil contains [redacted] clay. In other places the surface layer is thinner.

Included with these soils in mapping are small areas of Beadle, DeGrey, Glenham, Mobridge, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. Beadle and Glenham soils are in positions on the landscape similar to those of the Highmore soil. They are deeper to lime than the Java soil. Also, Beadle soils contain more clay in the subsoil than the Highmore and Java soils. The sodium affected DeGrey soils are in small depressions. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and low in the Java soil. The content of organic matter is moderate in the Highmore soil and low in the Java soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Runoff is medium. The shrink-swell potential is moderate.

About half of the acreage is cropland. These soils are suited to cultivated crops. Measures that control erosion and conserve moisture are the main management needs. Improving fertility also is a concern because the high content of lime in the surface layer of the Java soil

adversely affects the availability of plant nutrients. Leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage help to control erosion, conserve moisture, and improve fertility. Applying animal manure also improves fertility. Contour farming, grassed waterways, and terraces can help to control erosion, but in some areas slopes are too short or too irregular for contouring and terracing.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture, but the choice of pasture plants and productivity are limited on the Java soil because the high content of lime in the surface layer adversely affects the availability of plant nutrients. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of these soils for range; however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils are suited to windbreaks and environmental plantings, but the high content of lime in the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Highmore soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum growth, survival, and vigor are unlikely. Planting on the contour helps to control erosion.

The Highmore soil is in capability unit IIIe-1, the Java soil in capability unit IVe-3; both soils are in Silty range site.

HmA—Highmore-Mobridge silt loams, 0 to 4 percent slopes. These deep, nearly level, undulating and gently sloping soils are on uplands. The well drained Highmore soil is on the smooth and convex slopes. A few scattered stones commonly are on the surface. The moderately well drained Mobridge soil is in swales. It is occasionally flooded for very brief periods. Areas are 25 to several hundred acres in size and are irregular in shape. They are 40 to 60 percent Highmore soil and 20 to 40 percent Mobridge soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Highmore soil is dark grayish brown silt loam about 6 inches thick. The subsoil is brown and light brownish gray, friable silty clay loam about 20 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale yellow, light yellowish brown, and light gray, mottled, calcareous silt loam. In some places clay loam glacial till is at a depth of 20 to 40 inches. In other places the subsoil contains less clay.

Typically, the surface soil of the Mobridge soil is very dark grayish brown silt loam about 14 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, firm silty clay loam about 23 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. In places the subsoil contains more clay.

Included with these soils in mapping are small areas of DeGrey, Glenham, Java, and Plankinton soils. These included soils make up less than 25 percent of any one mapped area. The sodium affected DeGrey soils are in small depressions. Glenham soils contain more sand in the subsoil than the Highmore soil. They are in positions on the landscape similar to those of the Highmore soil. Java soils have lime at the surface and contain more sand in the subsoil than the Highmore and Mobridge soils. They are on knolls and ridges. The poorly drained Plankinton soils are in depressions.

Fertility is medium in the Highmore soil and high in the Mobridge soil. The content of organic matter is moderate in the Highmore soil and high in the Mobridge soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate. Runoff is medium on the Highmore soil and slow on the Mobridge soil. The shrink-swell potential is moderate in both soils.

Most of the acreage is cropland. These soils are suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage. In some years fieldwork is delayed because the Mobridge soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

These soils are suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well on the Highmore soil, except for those that require an abundant supply of moisture. Those that require an abundant supply of moisture grow especially well on the Mobridge soil.

The Highmore soil is in capability unit IIc-2, Silty range site; the Mobridge soil is in capability unit IIc-3, Overflow range site.

HoB—Hurley silt loam, 0 to 6 percent slopes. This moderately deep, well drained, nearly level and gently sloping soil is on uplands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth or slightly convex and are characterized by slight microrelief in some areas.

Typically, the surface layer is light brownish gray silt loam about 2 inches thick. The subsoil is dark grayish brown, very firm clay about 12 inches thick. In the lower part it is calcareous and has accumulations of lime and salts. The underlying material is grayish brown and light brownish gray, calcareous clay and shaly clay. It has accumulations of lime and salts. Light gray and olive yellow, calcareous shale bedrock is at a depth of about 30 inches. In some areas the shale is below a depth of 40 inches.

Included with this soil in mapping are small areas of Bullcreek, Chantier, Opal, and Promise soils. These soils make up less than 25 percent of any one mapped area. They do not have a sodium affected subsoil. Bullcreek soils are in positions on the landscape similar to those of the Hurley soil. Chantier, Opal, and Promise soils are slightly higher on the landscape than the Hurley soil.

Fertility and the content of organic matter are low in the Hurley soil. The sodium affected subsoil contains a detrimental amount of sodium salts. Tilth is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The dense claypan subsoil, the high content of salts in the subsoil, and the low available water capacity are limitations.

The capability unit is VIs-1, Thin Claypan range site.

HsA—Hurley-Slickspots complex, 1 to 4 percent slopes. This map unit occurs as areas of a moderately deep, well drained, nearly level and gently sloping Hurley soil intermingled with Slickspots. It is on uplands. The Hurley soil is on slight rises, and the Slickspots are in small depressions. Slopes are slightly concave. Areas are 10 to 200 acres in size and are irregular in shape. They are 55 to 65 percent Hurley soil and 15 to 25 percent Slickspots. The Hurley soil and the Slickspots occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Hurley soil is light brownish gray silt loam about 2 inches thick. The subsoil is dark grayish brown, very firm clay about 12 inches thick. In the lower part it is calcareous and has accumulations of lime and salts. The underlying material is grayish brown and light brownish gray, calcareous clay and shaly clay. It has accumulations of lime and salts. Light gray and olive yellow, calcareous shale bedrock is at a depth of about 30 inches. In some areas the shale is below a depth of 40 inches.

The surface of the Slickspots is so crusted that it is nearly impervious to water. Visible accumulations of salts are at or near the surface. The soil material to a depth of about 30 inches is dense, massive clay. Shale bedrock is at a depth of about 30 inches.

Included with the Hurley soil and the Slickspots in mapping are small areas of Bullcreek, Chantier, and Opal soils. These included soils make up less than 20 percent of any one mapped area. They do not have a sodium affected subsoil. Bullcreek soils are in positions on the landscape similar to those of the Hurley soil. Chantier and Opal soils are slightly higher on the landscape than the Hurley soil.

Fertility and the content of organic matter are low in the Hurley soil. The sodium affected subsoil contains a detrimental amount of salts. Tilth is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

All of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. The Slickspots generally support little or no vegetation, but they do support a sparse stand of weeds and pricklypear during wet periods.

This map unit is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. The dense claypan subsoil, the high content of salts in the subsoil, the low available water capacity, and the bare areas are limitations.

The Hurley soil is in capability unit VIs-1, Thin Claypan range site; the Slickspots are in capability unit VIIIs-3 and are not assigned to a range site.

JbE—Java-Betts loams, 9 to 20 percent slopes. These deep, well drained, strongly sloping and moderately steep soils are on uplands. The Java soil is on the mid and lower side slopes and on some of the broader ridgetops. The Betts soil is on ridges and the upper side slopes. Scattered glacial stones commonly are on the surface and throughout the soils (fig. 5). Areas are 10 to more than 200 acres in size and are irregular in shape. They are 45 to 55 percent Java soil and 25 to 35 percent Betts soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam.

Typically, the surface layer of the Betts soil is dark grayish brown, calcareous loam about 3 inches thick. The next layer is light brownish gray, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous clay loam. Accumulations of

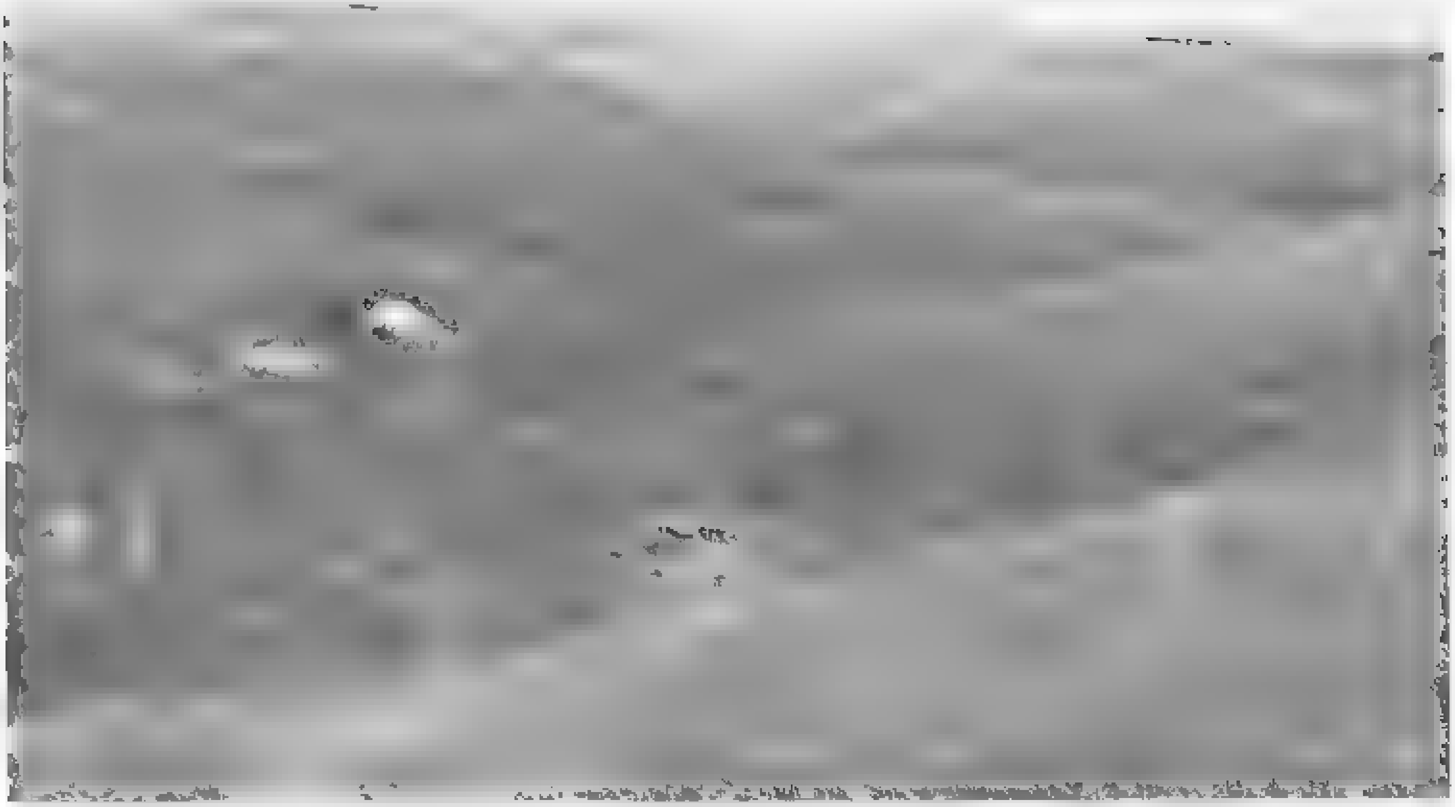

Figure 5.—Scattered stones on the surface of Java-Betts loams, 9 to 20 percent slopes. Nearly all areas of these soils are used as range.

lime are throughout the transitional layer and the upper part of the underlying material. Nests of gypsum and mottles are in the lower part of the underlying material. In places the soil contains more clay throughout.

Included with these soils in mapping are small areas of Delmont, Glenham, Okaton, and Schamber soils. These included soils make up less than 20 percent of any one mapped area. Delmont soils are 14 to 20 inches deep over sandy and gravelly material. They are on some knolls and ridges. Glenham soils are deeper to lime than the Java and Betts soils. They are in the less sloping areas. The shallow, clayey Okaton soils are in positions on the landscape similar to those of the Betts soil. Schamber soils are less than 10 inches deep to gravelly material. They are on knolls and ridges.

Fertility and the content of organic matter are low in the Java and Betts soils. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. The shrink-swell potential is moderate. Runoff is rapid.

Most of the acreage supports native grasses and is used for grazing. These strongly sloping and moderately steep soils are subject to water erosion unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Many areas in the deeper draws are suitable sites for stock water impoundments.

These soils are suited to tame pasture and hay, but the choice of pasture plants and productivity are limited by the low fertility and the high content of lime at the surface. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable species.

These soils generally are too steep for cultivated crops and windbreaks and environmental plantings. Trees and shrubs can be established for special purposes in the less sloping areas of the Java soil if they are planted by hand and given special care.

The capability unit is VIe-3; the Java soil is in Silty range site, the Betts soil is in Thin Upland range site.

JgC—Java-Glenham loams, 6 to 9 percent slopes. These deep, well drained, gently rolling or moderately sloping soils are on uplands. The Java soil is on knolls and ridges. The Glenham soil is on the smooth, lower side slopes. Glacial boulders and stones commonly are on the surface. Areas are 10 to 100 acres in size. They are long and narrow or are irregular in shape. They are 40 to 50 percent Java soil and 35 to 45 percent Glenham soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Java soil is dark grayish brown, calcareous loam about 4 inches thick. The subsoil is dark grayish brown and pale brown, friable, calcareous loam about 14 inches thick. In the lower part it has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and light yellowish brown, mottled, calcareous loam and clay loam. In places the dark colors extend to a depth of less than 7 inches.

Typically, the surface layer of the Glenham soil is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown, brown, and light brownish gray, friable clay loam about 12 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam. It is mottled in the lower part. In some areas the subsoil contains less sand. In other areas it contains more clay. In places the soil is dark to a depth of more than 20 inches.

Included with these soils in mapping are small areas of Delmont, Oahe, and Schamber soils. These included soils make up less than 25 percent of any one mapped area. They are underlain by gravelly material. Delmont and Oahe soils are on some of the higher, less sloping parts of the landscape. Schamber soils are on ridges.

Fertility is low in the Java soil and medium in the Glenham soil. The content of organic matter is low in the Java soil and moderate in the Glenham soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Runoff is medium. The shrink-swell potential is moderate.

Most of the acreage supports native grasses and is used for grazing or hay. No major hazards or limitations affect the use of these soils for range; however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils are suited to cultivated crops. The high content of lime in the surface layer of the Java soil adversely affects the availability of plant nutrients. Measures that help to control erosion, conserve moisture, and improve fertility are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Contour farming and terracing can help to control erosion, but in some areas the slopes are too short or too irregular for contouring or terracing. Grassed waterways help to keep gullies from forming. In some areas the surface stones hinder the use of farm machinery.

A cover of hay or tame pasture plants is effective in controlling erosion. These soils are suited to tame pasture and hay, but the choice of plants and productivity are limited on the Java soil by the low fertility and a high content of lime at the surface. Alfalfa, intermediate wheatgrass, and smooth bromegrass are suitable species.

These soils are suited to windbreaks and environmental plantings, but the high content of lime at the surface of the Java soil is a limitation. All climatically suited trees and shrubs grow well on the Glenham soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Java soil, but optimum growth, vigor, and survival are unlikely. Planting on the contour helps to control erosion.

The Java soil is in capability unit IVe-3, Silty range site; the Glenham soil is in capability unit IIIe-2, Silty range site.

Ko—Kolls silty clay. This deep, poorly drained, level soil is in depressions on uplands. It is ponded during periods of snowmelt and heavy rainfall. Areas are 10 to 250 acres in size and are oval or irregular in shape. Slopes are slightly concave.

Typically, the surface layer is gray silty clay about 2 inches thick. The subsoil is gray, very firm, mottled, calcareous clay about 24 inches thick. The underlying material to a depth of 60 inches is gray, very firm, mottled, calcareous clay. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the well drained Promise soils. These soils are near the edges of the mapped areas. They make up less than 5 percent of any one mapped area.

Fertility is medium and the content of organic matter moderate in the Kolls soil. Tilth is poor. Available water capacity is low or moderate. Permeability is very slow. A seasonal high water table is within a depth of 1.5 feet most of the year. As much as 1.0 foot of water ponds on the surface during some wet periods. Runoff is ponded. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings. The ponding is a hazard.

This soil is suited to tame pasture and hay, but the choice of pasture plants is limited because natural drainage is restricted. Western wheatgrass is the best suited pasture plant. Other suitable species are Garrison creeping foxtail and reed canarygrass.

The capability unit is Vw-4; Closed Depression range site.

La—Lane silty clay loam. This deep, moderately well drained, nearly level soil is on low terraces and flood plains. It is subject to rare flooding. Areas are 15 to 300 acres in size and are mostly irregular in shape. Slopes generally are smooth.

Typically, the surface soil is dark gray silty clay loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark gray, dark grayish brown, and grayish brown, firm silty clay loam and silty clay. In the lower part it is calcareous, is mottled, and has accumulations of lime. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay loam and clay. It has accumulations of lime throughout. It is mottled in the upper part. It has nests of gypsum in the lower part.

Included with this soil in mapping are small areas of Bon, Durrstein, Egas, and Farmsworth soils. These soils make up less than 25 percent of any one mapped area. Bon soils contain less clay throughout than the Lane soil. They are in positions on the landscape similar to those of the Lane soil. Durrstein, Egas, and Farmsworth soils are slightly lower on the landscape than the Lane soil. Durrstein and Farmsworth soils have a sodium affected subsoil. Egas soils contain more salts throughout than the Lane soil.

Fertility and the content of organic matter are high in the Lane soil. Tilth is fair. Available water capacity is moderate or high. Permeability is moderately slow. Runoff is slow. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Measures that conserve moisture and improve tilth are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Chiseling or subsoiling improves tilth and increases the rate of water intake.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIs-1; Clayey range site.

Lf—Lane-Farmsworth silt loams. These deep, nearly level soils are on flood plains and stream terraces. The moderately well drained Lane soil is on slight rises. The somewhat poorly drained Farmsworth soil is in small, shallow depressions. Both soils are subject to rare flooding. Areas are 10 to more than 100 acres in size and are irregular in shape. They are about 40 to 50 percent Lane soil and 30 to 40 percent Farmsworth soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Lane soil is dark gray silty clay loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark gray, dark grayish brown, and grayish brown, firm silty clay loam and silty clay. In the lower part it is calcareous, is mottled, and has accumulations of lime. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous silty clay loam and clay. It has accumulations of lime throughout. It is mottled in the upper part. It has nests of gypsum in the lower part.

Typically, the surface layer of the Farmsworth soil is gray silt loam about 5 inches thick. The subsurface layer is light gray silt loam about 3 inches thick. The subsoil is dark gray and dark grayish brown, very firm silty clay about 31 inches thick. In the lower part it is calcareous and has visible salts. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, mottled, calcareous silty clay loam. It has visible salts in the upper part.

Included with these soils in mapping are small areas of Bon, Durrstein, Egas, and Ree soils. These included soils make up less than 25 percent of any one mapped area. Bon soils do not have a sodium affected subsoil and contain less clay throughout than the Lane soil. They are in positions on the landscape similar to those of the Lane soil. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains. The well drained Ree soils are on terraces.

Fertility is high in the Lane soil and medium in the Farmsworth soil. The content of organic matter is high in the Lane soil and moderate in the Farmsworth soil. The Farmsworth soil has a sodium affected subsoil that restricts root penetration. Tilth is fair in the Lane soil and poor in the Farmsworth soil. Available water capacity is moderate or high in both soils. Permeability is moderately slow in the Lane soil and slow or very slow in the Farmsworth soil. A seasonal high water table is at a depth of 3 to 6 feet in the Farmsworth soil. Runoff is slow. The shrink-swell potential is high.

About half of the acreage is cropland. These soils are suited to cultivated crops, but the sodium affected subsoil in the Farmsworth soil can restrict the penetration of plant roots. Early maturing small grain is

better suited than corn. Tilling when the soils are wet causes surface compaction. Measures that improve tilth, increase the rate of water intake, and conserve moisture are the main management needs. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Subsoiling or chiseling helps to break up the claypan subsoil in the Farmsworth soil and increases the rate of water intake for a short time.

These soils are suited to tame pasture and hay, but the choice of pasture plants is limited by the claypan subsoil in the Farmsworth soil. Examples of suitable pasture plants are alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass. Deferred grazing during wet periods helps to prevent surface compaction.

No major hazards or limitations affect the use of these soils for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity. Many areas of the Farmsworth soil are potential sites for excavated ponds.

These soils are suited to windbreaks and environmental plantings, but the dense claypan subsoil in the Farmsworth soil severely limits root penetration. All climatically suited trees and shrubs grow well on the Lane soil except for those that require an abundant supply of moisture. Plantings can be established on the Farmsworth soil, but optimum growth, survival, and vigor are unlikely.

The Lane soil is in capability unit IIs-1, Clayey range site; the Farmsworth soil is in capability unit IVs-2, Claypan range site.

LoA—Lowry silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are 10 to more than 200 acres in size and are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam. In places lime is closer to the surface. In some areas the soil contains more clay throughout. In other areas it is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Dorna soils. These soils make up less than 10 percent of any one mapped area. They are underlain by clayey material at a depth of 20 to 40 inches. They are in positions on the landscape similar to those of the Lowry soil.

Fertility is medium and the content of organic matter moderate in the Lowry soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

Most of the acreage is cropland. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and help to control wind erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Silty range site.

LoB—Lowry silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are 25 to more than 300 acres in size and are irregular in shape. Slopes generally are long and smooth.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam. In some areas the soil contains more clay throughout. In other areas it is dark to a depth of more than 20 inches. In places lime is closer to the surface.

Included with this soil in mapping are small areas of Dorna soils. These soils make up less than 10 percent of any one mapped area. They are underlain by clayey material at a depth of 20 to 40 inches. They are in positions on the landscape similar to those of the Lowry soil.

Fertility is medium and the content of organic matter moderate in the Lowry soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is cropland. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture and help to control erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces can help to control erosion.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of

moisture. Planting on the contour helps to control erosion.

The capability unit is IIe-1, Silty range site.

LvA—Lowry Variant silt loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is moderately deep over sandy material. Areas are 10 to 500 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 9 inches thick. It is calcareous in the lower part. The upper part of the underlying material, to a depth of about 36 inches, is pale brown and light gray, calcareous loam, very fine sandy loam, and loamy very fine sand. The lower part to a depth of 60 inches is light brownish gray, calcareous fine sand and sand. In some areas the underlying material contains less sand. In other areas it is gravelly. In places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is good. Because of the porous underlying material, root development is limited and the soil is somewhat droughty. Available water capacity is low or moderate. Permeability is moderate in the upper part of the soil and moderately rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. Many areas are irrigated. This soil is suited to cultivated crops, but it is droughty. It is better suited to small grain than to corn. Measures that conserve moisture are the main management needs. Examples are leaving crop residue on the surface and minimizing tillage.

This soil is suited to tame pasture and hay. Only those grasses that are drought resistant, however, are suitable. Crested wheatgrass and pubescent wheatgrass are examples.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival, and vigor are unlikely.

The capability unit is IIIs-2; Silty range site.

LvB—Lowry Variant silt loam, 2 to 6 percent slopes. This well drained, undulating soil is on uplands. It is moderately deep over sand. Areas are 10 to 300 acres in size and are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 9 inches thick. It is calcareous in the lower part. The upper part of the underlying material, to a depth of about 36 inches, is pale brown and light gray, calcareous loam, very fine sandy loam, and loamy very fine sand. The lower part to a depth of 60 inches is light brownish gray, calcareous fine sand and sand. In some areas the underlying material contains less sand. In other areas it is gravelly. In places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is good. Because of the porous underlying material, root development is limited and the soil is somewhat droughty. Available water capacity is low or moderate. Permeability is moderate in the upper part of the soil and moderately rapid in the underlying material. Runoff is medium.

Most of the acreage is cropland. Many areas are irrigated. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface and minimizing tillage.

A cover of tame pasture or hay is effective in controlling erosion. This soil is suited to tame pasture and hay. Only those grasses that are drought resistant, however, are suitable. Examples are crested wheatgrass and pubescent wheatgrass.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival, and vigor are unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-6; Silty range site.

MaB—McClure silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth and slightly convex.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, friable silt loam in the upper part; dark grayish brown, friable, calcareous silty clay loam in the next part; and light brownish gray, firm, calcareous silty clay in the lower part. It has accumulations of lime in the middle and lower parts. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay. It has accumulations of lime throughout. In places the subsoil is silty clay.

Included with this soil in mapping are small areas of Promise and Uly soils. These soils make up less than 25 percent of any one mapped area. They are in positions on the landscape similar to those of the McClure soil.

Promise soils are clayey throughout. Uly soils are silty throughout.

Fertility is medium and the content of organic matter moderate in the McClure soil. Tilth is good. Available water capacity is moderate or high. Permeability is moderately slow in the subsoil and slow in the underlying material. Runoff is medium. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Contour farming helps to control erosion.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is IIe-1; Silty range site.

MaC—McClure silt loam, 6 to 11 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are 10 to 200 acres in size and are irregular in shape. Slopes generally are convex.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick. It is dark grayish brown, friable silt loam in the upper part, dark grayish brown, friable, calcareous silty clay loam in the next part, and light brownish gray, firm, calcareous silty clay in the lower part. It has accumulations of lime in the middle and lower parts. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay. It has accumulations of lime throughout. In places the subsoil is silty clay.

Included with this soil in mapping are small areas of Opal and Uly soils. These soils make up less than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the McClure soil. Opal soils are clayey throughout and are 20 to 40 inches deep to shale. Uly soils are silty throughout.

Fertility is medium and the content of organic matter moderate in the McClure soil. Tilth is good. Available water capacity is moderate or high. Permeability is moderately slow in the subsoil and slow in the underlying material. Runoff is medium. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. No major hazards or limitations affect the use of this soil for range; however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This soil is suited to cultivated crops. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Contour farming, grassed waterways, and terraces can help to control erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is IIIe-2; Silty range site.

MbA—Millboro silty clay loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 80 to more than 300 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm silty clay about 31 inches thick. In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown, calcareous silty clay. It has accumulations of lime throughout. It has accumulations of salts in the lower part. In places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is fair. Available water capacity is moderate. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay (fig. 6). Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that improve tilth and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake for a short time. Stripcropping and field windbreaks help to control wind erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

Figure 6.—Newly mown hay in an area of Millboro silty clay loam, 0 to 2 percent slopes. An area of Sansarc-Opal clays, 12 to 20 percent slopes, is in the background.

This soil is suited to windbreaks and environmental plantings. however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely

The capability unit is IIIs-3; Clayey range site

MbB—Millboro silty clay loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are long and smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm silty clay about 31 inches thick In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown, calcareous silty clay It has accumulations of lime throughout. It has accumulations of salts in the lower part In places the soil is dark to a depth of more than 20 inches.

Fertility is medium, and the content of organic matter is moderate. Tilth is fair Available water capacity is moderate Permeability is slow Runoff is medium. The shrink-swell potential is high.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling

or subsoiling improves tilth and increases the rate of water intake for a short time. Contour farming helps to control water erosion. Stripcropping and field windbreaks help to control wind erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4, Clayey range site.

MbC—Millboro silty clay loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 10 to 80 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm silty clay about 31 inches thick. In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light olive brown, calcareous silty clay. It has accumulations of lime throughout. It has accumulations of salts in the lower part. In some places the soil is dark to a depth of more than 20 inches. In other places shale bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Okaton soils on ridges. These soils make up less than 10 percent of any one mapped area. They are 6 to 20 inches deep to shale.

Fertility is medium and the content of organic matter moderate in the Millboro soil. Tilth is fair. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and improve tilth are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake for a short time. Contour farming, grassed waterways, and terraces can help to control erosion.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4, Clayey range site.

MoA—Mobridge silt loam. This deep, moderately well drained, nearly level soil is in swales. It is occasionally flooded for very brief periods. Areas are 10 to more than 200 acres in size. They are long and narrow or are irregular in shape. Slopes are smooth and are plane or concave.

Typically, the surface soil is very dark grayish brown silt loam about 14 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable and firm silty clay loam about 23 inches thick. In the lower part it is calcareous and has accumulations of lime. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. It has accumulations of lime throughout. In some areas the subsoil contains more clay. In other areas it contains more sand. In places visible salts are in the underlying material.

Included with this soil in mapping are small areas of Beadle, Eakin, Highmore, and Plankinton soils. These soils make up less than 25 percent of any one mapped area. The well drained Beadle, Eakin, and Highmore soils are on the higher parts of the landscape. The poorly drained Plankinton soils are in depressions.

Fertility and the content of organic matter are high in the Mobridge soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow. The shrink-swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture during dry periods are the main management needs in cultivated areas. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples. In some years fieldwork is delayed because the soil receives runoff from adjacent soils, but in most years the additional moisture is beneficial.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well. Those that require an abundant supply of moisture grow especially well.

The capability unit is IIc-3; Overflow range site.

Mp—Mobridge-Plankinton silt loams. These deep level and nearly level soils are in swales and depressions in the uplands. The moderately well drained Mobridge soil is in swales. It is occasionally flooded for brief periods. The poorly drained Plankinton soil is in the lowest parts of swales and in depressions within the swales. It is ponded during periods of heavy rainfall or rapid snowmelt. Areas are 10 to more than 200 acres in size. They are long and narrow or are irregular in shape. They are about 50 to 70 percent Mobridge soil and 20 to 40 percent Plankinton soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface soil of the Mobridge soil is very dark grayish brown silt loam about 14 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, friable and firm silty clay loam about 23 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. It has accumulations of lime throughout. In places the subsoil contains more clay.

Typically, the surface layer of the Plankinton soil is dark gray silt loam about 4 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is dark gray, very firm silty clay about 33 inches thick. In the lower part it has accumulations of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay and silty clay loam. It is mottled in the lower part. In places the subsoil has been affected by a high content of sodium.

Included with these soils in mapping are small areas of the well drained Eakin and Highmore soils on higher parts of the landscape. These included soils make up less than 15 percent of any one mapped area.

Fertility is high in the Mobridge soil and medium in the Plankinton soil. The content of organic matter is high in both soils. Tilth is good in the Mobridge soil and poor in the Plankinton soil. Available water capacity is high in the Mobridge soil and moderate in the Plankinton soil. A seasonal high water table is within a depth of 1 foot in the Plankinton soil. As much as 1 foot of water ponds on this soil during some wet periods. Permeability is moderate in the Mobridge soil and very slow in the Plankinton soil. Runoff is slow on the Mobridge soil and ponded on the Plankinton soil. The shrink-swell potential is moderate in the Mobridge soil and high in the Plankinton soil.

About half of the acreage is cropland. These soils are suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Garrison creeping foxtail and reed canarygrass are suited to the Plankinton soil. Improving the tilth of the Plankinton soil and controlling the ponding on that soil are the main concerns in managing cultivated areas. Returning crop residue to the soils and delaying tillage when the soils are wet improve tilth. Surface drains and measures that divert the runoff from adjacent soils help to remove the excess water.

No major hazards or limitations affect the use of the Mobridge soil for range. Compaction and ponding are problems on the Plankinton soil. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas of the Plankinton soil are potential sites for excavated ponds.

The Mobridge soil is suited to windbreaks and environmental plantings, but the Plankinton soil generally is unsuited. All climatically suited trees and shrubs grow well on the Mobridge soil. Those that require an abundant moisture supply grow especially well. No trees or shrubs grow well in undrained areas of the Plankinton soil.

The Mobridge soil is in capability unit IIc-3, Overflow range site. The Plankinton soil is in capability unit IVw-1, Closed Depression range site.

Oe—Oahe loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is moderately deep over sandy and gravelly material. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is about 10 inches thick. It is dark grayish brown, friable loam and firm clay loam. The upper 10 inches of the underlying material is grayish brown, calcareous loam. The lower part to a depth of 60 inches is multicolored, calcareous gravelly loamy sand. In some places the soil is dark to a depth of more than 20 inches. In other places the gravelly material is at a depth of 14 to 20 inches.

Included with this soil in mapping are small areas of Ree soils. These soils make up less than 20 percent of any one mapped area. They do not have gravelly material within a depth of 40 inches. They are in positions on the landscape similar to those of the Oahe soil.

Fertility is medium and the content of organic matter moderate in the Oahe soil. Tilth is good. Available water capacity is low. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Runoff is slow.

About half of the acreage is cropland. This soil is suited to cultivated crops, but it is droughty. It is better suited to small grain than to corn. Measures that conserve moisture are the main management needs. Examples are leaving crop residue on the surface and including grasses and legumes in the cropping system.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival, and vigor are unlikely.

This soil is a probable source of sand and gravel.

The capability unit is IIIs-2; Silty range site.

OdB—Oahe-Delmont loams, 2 to 6 percent slopes. These undulating soils are on terraces. The well drained Oahe soil is moderately deep over sandy and gravelly material. It is on the lower side slopes. The somewhat excessively drained Delmont soil is shallow over gravelly material. It is on knolls and ridges. Areas are 10 to 250 acres in size and are irregular in shape. They are about 40 to 50 percent Oahe soil and 35 to 45 percent Delmont soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Oahe soil is dark grayish brown loam about 4 inches thick. The subsoil is about 10 inches thick. It is dark grayish brown, friable loam and firm clay loam. The upper 10 inches of the underlying material is grayish brown, calcareous loam. The lower part to a depth of 60 inches is multicolored, calcareous gravelly loamy sand. In some places the subsoil contains more clay. In other places the soil is dark to a depth of more than 20 inches.

Typically, the surface layer of the Delmont soil is dark grayish brown loam about 4 inches thick. The subsoil is dark gray, friable, calcareous loam about 12 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly sand. It has accumulations of lime in the upper part. In places the gravelly sand is at a depth of less than 14 inches.

Included with these soils in mapping are small areas of Ree soils. These included soils make up less than 20 percent of any one mapped area. They do not have gravelly material within a depth of 40 inches. They are in the smoother areas.

Fertility is medium and the content of organic matter moderate in the Oahe and Delmont soils. Tilth is good. Available water capacity is low. Permeability is moderate in the upper part of the profile and rapid in the gravelly underlying material. Runoff is medium.

About half of the acreage is cropland. These soils are suited to cultivated crops, but they are droughty. They are better suited to small grain and grasses than to late maturing crops, such as corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system.

A cover of tame pasture plants or hay is effective in controlling erosion. These soils are suited to tame pasture and hay, but productivity is limited because of the droughtiness. Only drought-resistant plants are suitable. Examples of suitable pasture plants are crested wheatgrass and pubescent wheatgrass.

No major hazards or limitations affect the use of these soils for range. Productivity is limited, however, because the Delmont soil is droughty.

These soils are suited to windbreaks and environmental planting, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum survival, growth, and vigor are unlikely.

These soils are a probable source of sand and gravel.

The Oahe soil is in capability unit IIe-6, Silty range site; the Delmont soil is in capability unit IVe-6, Shallow to Gravel range site.

OeF—Okaton bouldery silty clay, 15 to 40 percent slopes. This shallow, well drained, moderately steep and steep soil is on uplands. Areas are 50 to more than 400 acres in size and are irregular in shape. Slopes are mostly convex. A rimrock of hard sandstone is at the highest elevations. Scattered stones and boulder sized pieces of this outcrop commonly are on the surface. Landslides have occurred in some areas.

Typically, the surface layer is grayish brown, calcareous bouldery silty clay about 1 inch thick. The next layer is grayish brown and light yellowish brown, firm, calcareous silty clay about 3 inches thick. The underlying material is light yellowish brown and light olive brown, calcareous clay and shaly clay. Light brownish gray and pale yellow, calcareous shale is at a depth of about 16 inches. Gypsum and other salts are in the seams of the shale. In some places the depth to shale is more than 20 inches. In other places fewer boulders are on the surface.

Included with this soil in mapping are small areas of the deep, loamy Betts and Java soils and soils that formed in silty or sandy material. These soils make up less than 25 percent of any one mapped area. Betts and Java soils are in positions on the landscape similar to those of the Okaton soil.

Fertility and the content of organic matter are low in the Okaton soil. Tilth is poor. Available water capacity is very low. Permeability is slow. Runoff is rapid. The shrink-swell potential is high.

All areas of this soil support native grasses and are used for grazing. Water erosion is a hazard on this moderately steep and steep soil unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas. Gullies form along some cattle trails.

This soil is too steep and too bouldery for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-8, Shallow range site.

OkB—Oko loam, 2 to 7 percent slopes. This deep, well drained, undulating soil is on uplands. Areas range from 10 to 150 acres in size and are irregular in shape.

Slopes are smooth or slightly convex. Scattered stones commonly are on the surface.

Typically, the surface layer is dark gray loam about 5 inches thick. The subsoil is dark grayish brown and grayish brown, firm clay about 18 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is light olive gray, calcareous clay. It has visible salts in the lower part. In some places the subsoil contains less clay. In other places the depth to lime is less than 5 inches.

Included with this soil in mapping are small areas of Cavo, Glenham, Java, and Promise soils. These soils make up less than 25 percent of any one mapped area. Cavo soils have a sodium affected subsoil. They are in small depressions on the lower side slopes. Glenham and Java soils are slightly higher on the landscape than the Oko soil. Also, they have less clay in the control section. Promise soils contain more clay in the subsoil than the Oko soil. They are on the lower parts of the landscape.

Fertility is medium and the content of organic matter moderate in the Oko soil. Tilth is fair. Available water capacity is moderate. Permeability is slow. Runoff is medium. The shrink-swell potential is high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. Measures that help to control erosion, improve tilth, and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Chiseling or subsoiling improves tilth and increases the rate of water intake for a short time.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4, Clayey range site.

OmB—Opal silty clay, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 10 to more than 100 acres in size and are irregular in shape. Slopes are mostly smooth and convex. A few small pebbles are on the surface in most areas.

Typically, the surface layer is gray silty clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous clay. It has accumulations of lime throughout. Light gray shale bedrock is at a depth of about 37 inches. In some places the depth to shale is more than 40 inches. In other places the soil is more saline.

Included with this soil in mapping are small areas of Chantier soils. These soils make up about 10 percent of most mapped areas. They are less than 20 inches deep to shale and contain more salts throughout than the Opal soil. Also, they are slightly lower on the landscape.

Fertility is medium and the content of organic matter moderate in the Opal soil. Tilth is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

This soil is suited to cultivated crops. It is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that improve tilth, conserve moisture, and help to control erosion are the main management needs. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Stripcropping and field windbreaks help to control wind erosion. Contour farming, grassed waterways, and terraces help to control water erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IIIe-4, Clayey range site.

OmC—Opal silty clay, 6 to 11 percent slopes. This moderately deep, well drained, moderately sloping and strongly sloping soil is on uplands. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 25 to more than 200 acres in size and are irregular in shape. Slopes are smooth and convex. A few scattered stones commonly are on the surface.

Typically, the surface layer is gray silty clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous clay. It has accumulations of lime throughout. Light gray shale bedrock is at a depth of about 37

inches. In some areas the depth to shale is more than 40 inches.

Included with this soil in mapping are small areas of Bullcreek, Chantier, Hurley, and Sansarc soils. These soils make up less than 25 percent of any one mapped area. Bullcreek soils contain more salts than the Opal soil and are more than 40 inches deep to shale. They are near drainageways. Chantier and Sansarc soils are less than 20 inches deep to shale. Chantier soils are lower on the landscape than the Opal soil. Sansarc soils are on ridges. Hurley soils have a sodium affected subsoil. They are on foot slopes.

Fertility is medium and the content of organic matter moderate in the Opal soil. Tilth is poor. Available water capacity is low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that help to control erosion and improve tilth are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, minimizing tillage, and leaving crop residue on the surface. Contour farming, grassed waterways, and terraces can help to control erosion, but the slopes in some areas are too short or too irregular for contouring and terracing.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely. Planting on the contour helps to control erosion.

The capability unit is IVe-4; Clayey range site.

OpB—Opal clay, saline, 1 to 6 percent slopes. This moderately deep, well drained, undulating soil is on uplands. Areas are 40 to 150 acres in size and are irregular in shape. Slopes are long and are characterized by slight microrelief.

Typically, the surface layer is dark grayish brown clay about 4 inches thick. The subsoil is dark grayish brown, very firm clay about 15 inches thick. In the lower part it has accumulations of gypsum and other salts. The underlying material is grayish brown clay. It has nests of gypsum and accumulations of lime throughout. Grayish brown shale bedrock is at a depth of about 24 inches. In some places the shale is within a depth of 20 inches. In other places the content of salts is lower.

Included with this soil in mapping are small areas of Hurley soils and Slickspots. These inclusions make up less than 15 percent of any one mapped area. Hurley soils have a sodium affected subsoil. They are in positions on the landscape similar to those of the Opal soil. Slickspots have a puddled surface and do not support vegetation. They occur in a random pattern throughout the mapped areas.

Fertility and the content of organic matter are low in the Opal soil. The soil is slightly affected by salts. Tilth is poor. Available water capacity is low or very low. Permeability is very slow. Runoff is medium. The shrink-swell potential is very high.

Nearly all areas support native grasses and are used for grazing or hay. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. If the range is overgrazed, the extent of bare areas or Slickspots increases. Establishing vegetation is difficult in denuded areas.

Because of the salinity and the density of the subsoil, this soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIs-5; Dense Clay range site.

Or—Orthents, loamy. This map unit consists of soils in and near open excavations from which sand and gravel have been removed. Areas are 5 to more than 40 acres in size and irregular in shape. Slopes are uneven and broken. They range from nearly level on the pit bottoms to almost vertical on the sides.

The pit bottoms are dominantly gravelly sandy loam. In areas where all the sand and gravel has been removed, however, they are loam or clay loam glacial till. Mounds of mixed loamy overburden are on the edges of the areas. The bottoms and sides of the excavations support little or no vegetation during periods when gravel is being removed.

Included with these soils in mapping are small areas of Delmont, Oahe, Orton, and Schamber soils. These included soils make up less than 25 percent of any one mapped area. They are in unexcavated areas. Delmont soils are 14 to 20 inches deep over gravelly material. Oahe and Orton soils are 20 to 40 inches deep over gravelly material, and Schamber soils are less than 10 inches deep over gravelly material. Pits where gravel is being removed are also included in mapping.

Most of the acreage is used only as a source of sand and gravel. Some areas provide limited wildlife habitat. Abandoned excavations can be restored to range, tame pasture, or cropland if reclamation measures are applied. These measures include shaping the areas and using the mounds of overburden material as topsoil. Applying fertilizer as needed helps to establish the range or pasture.

The capability unit is VIIIs-2; no range site is assigned.

OtA—Orton loam, 0 to 2 percent slopes. This well drained, nearly level soil is on terraces. It is moderately deep over gravelly sand. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable loam about 18 inches thick. In the lower part it is calcareous and has accumulations of lime. The upper 15 inches of the underlying material is light brownish gray and pale brown, calcareous fine sandy loam. It has accumulations of lime throughout. The lower part to a depth of 60 inches is multicolored, calcareous very gravelly sand. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Lowry, Lowry Variant, and Millboro soils. These soils make up less than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the Orton soil. They do not have gravelly material within a depth of 40 inches. Also, the Millboro soils are clayey throughout.

Fertility is medium and the content of organic matter moderate in the Orton soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderately rapid in the upper part of the soil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to corn. Measures that conserve moisture are the main management needs. Examples are including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage.

This soil is suited to tame pasture and hay, but it is droughty. Examples of suitable pasture plants are alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Plantings can be established, but optimum growth and vigor are unlikely.

This soil is a probable source of sand and gravel.

The capability unit is IIIe-7; Sandy range site.

OtB—Orton loam, 2 to 6 percent slopes. This well drained, gently sloping soil is on terraces. It is moderately deep over gravelly material. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable loam about 18 inches thick. In the lower part it is calcareous and has accumulations of lime. The upper 15 inches of the underlying material is light brownish gray and pale brown, calcareous fine sandy loam. It has accumulations of lime throughout. The lower part to a depth of 60 inches is multicolored, calcareous very gravelly sand. In places the subsoil contains more clay.

Included with this soil in mapping are small areas of Lowry, Lowry Variant, and Millboro soils. These soils make up less than 20 percent of any one mapped area. They are in positions on the landscape similar to those of the Orton soil. They do not have gravelly material within a depth of 40 inches. Also, the Millboro soils are clayey throughout.

Fertility is medium and the content of organic matter moderate in the Orton soil. Tilth is good. Available water capacity is low or moderate. Permeability is moderately rapid in the upper part of the soil and rapid in the underlying material. Runoff is slow.

Most of the acreage is cropland. This soil is suited to cultivated crops, but it is somewhat droughty. It is better suited to small grain than to corn. Measures that help to control erosion and conserve moisture are the main management needs. Examples are leaving crop residue on the surface, including grasses and legumes in the cropping system, and minimizing tillage.

This soil is suited to tame pasture and hay, but it is droughty. Examples of suitable pasture plants are alfalfa, crested wheatgrass, intermediate wheatgrass, and smooth bromegrass.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings, but the droughtiness is a limitation. Trees and shrubs can be established, but optimum growth, survival, and vigor are unlikely.

This soil is a probable source of sand and gravel.

The capability unit is IIIe-8; Sandy range site.

OwE—Orton-Schamber loams, 9 to 25 percent slopes. These strongly sloping and moderately steep soils are on terrace remnants. The well drained Orton soil is on the smooth or slightly convex slopes. The excessively drained Schamber soil is on short, convex slopes. The Orton soil is moderately deep to gravelly material, and the Schamber soil is very shallow to gravelly material. Areas are 40 to more than 100 acres in size and generally are long and narrow. They are about 40 to 50 percent Orton soil and 35 to 45 percent Schamber soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Orton soil is dark grayish brown loam about 6 inches thick. The subsoil is dark grayish brown and grayish brown, very friable loam about 6 inches thick. In the lower part it is calcareous and has accumulations of lime. The upper 15 inches of the underlying material is light brownish gray and pale brown, calcareous fine sandy loam. It has accumulations of lime throughout. The lower part to a depth of 60 inches is multicolored, calcareous very gravelly sand.

Typically, the surface layer of the Schamber soil is dark grayish brown, calcareous loam about 3 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly loamy sand and gravelly sand. In places the surface layer is thicker.

Included with these soils in mapping are small areas of Lowry and Ree soils. These included soils make up less than 20 percent of any one mapped area. The silty Lowry soils and the loamy Ree soils are more than 40 inches deep to gravelly material. Lowry soils generally are on the lower foot slopes. Ree soils generally are on high flats.

Fertility is medium in the Orton soil and low in the Schamber soil. The content of organic matter is moderate in the Orton soil and low in the Schamber soil. Available water capacity is moderate or low in the Orton soil and very low in the Schamber soil. Permeability is moderately rapid in the upper part of the Orton soil and rapid in the gravelly underlying material. It is rapid in the Schamber soil. Runoff is medium on the Orton soil and slow on the Schamber soil.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Productivity is limited because the Schamber soil is droughty. Establishing vegetation is difficult in denuded areas.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the droughtiness and the slope. They are a probable source of sand and gravel.

The Orton soil is in capability unit VIe-6, Sandy range site; the Schamber soil is in capability unit VIs-4, Very Shallow range site.

Pa—Plankinton silt loam. This deep, poorly drained, level soil is in depressions on uplands. It is ponded during periods of snowmelt or heavy rainfall. Areas are 10 to 100 acres in size and generally are circular or oblong.

Typically, the surface layer is dark gray silt loam about 4 inches thick. The subsurface layer is gray silt loam about 2 inches thick. The subsoil is dark gray, very firm silty clay about 33 inches thick. In the lower part it has accumulations of lime and gypsum that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown, calcareous silty clay and silty clay loam. It is mottled in the lower part. In some places the soil has a sodium affected subsoil. In other places it is very poorly drained.

Included with this soil in mapping are small areas of the moderately well drained Mobridge soils in swales. These soils make up less than 10 percent of any one mapped area.

Fertility is medium and the content of organic matter high in the Plankinton soil. Tilth is poor. Available water capacity is moderate. A seasonal high water table is within a depth of 1 foot most of the year. As much as 1 foot of water ponds on the surface during some wet periods. Permeability is very slow. Runoff is ponded. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing or hay. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil is suited to cultivated crops and to tame pasture and hay, but the ponding is a hazard. Examples of suitable pasture plants are Garrison creeping foxtail and reed canarygrass. Measures that improve tilth, drainage, and the rate of water intake are the main management needs in cultivated areas. Chiseling or subsoiling, including grasses and legumes in the cropping system, and installing surface drains are examples.

This soil generally is unsuited to windbreaks and environmental plantings unless it is drained.

The capability unit is IVw-1, Closed Depression range site.

PrA—Promise silty clay, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands, fans, and terraces. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes generally are smooth. A few small pebbles commonly are on the surface.

Typically, the surface layer is dark gray silty clay about 7 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay. It is mottled in the lower part. In places the depth to shale is less than 40 inches.

Included with this soil in mapping are small areas of Bullcreek, Carter, Dorna, Hurley, and Wendte soils. These soils make up less than 25 percent of any one mapped area. Bullcreek, Carter, Dorna, and Hurley soils are in positions on the landscape similar to those of the Promise soil. Bullcreek soils have visible salts in the subsoil and are more dense than the Promise soil. Carter

soils have a claypan subsoil. Dorna soils formed in silty material 20 to 40 inches deep over clayey material. Hurley soils have a sodium affected subsoil and are 20 to 40 inches deep over shale. The moderately well drained Wendte soils are on narrow flood plains.

Fertility is medium and the content of organic matter moderate in the Promise soil. Tilth is poor. Available water capacity is low or moderate. Permeability is very slow. Runoff is slow. The shrink-swell potential is very high.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that improve tilth, help to control wind erosion, and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, subsoiling or chiseling, and including grasses and legumes in the cropping system. Stripcropping and field windbreaks can help to control wind erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIs-3, Clayey range site.

PrB—Promise silty clay, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands, fans, and terraces. When dry, it is characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Areas are 20 to several hundred acres in size and are irregular in shape. Slopes are smooth or slightly convex. A few small pebbles commonly are on the surface.

Typically, the surface layer is dark gray silty clay about 7 inches thick. The subsoil is dark grayish brown and grayish brown, firm and very firm clay about 26 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, calcareous clay. It is mottled in the lower part. In some areas the depth to shale is less than 40 inches.

Included with this soil in mapping are small areas of Bullcreek and Carter soils. These soils make up less than 15 percent of any one mapped area. They are in positions on the landscape similar to those of the Promise soil. Bullcreek soils have visible salts in the subsoil and are more dense than the Promise soil. Carter soils have a dense claypan subsoil.

Fertility is medium and the content of organic matter moderate in the Promise soil. Tilth is poor. Available water capacity is low or moderate. Permeability is very slow. Runoff is medium. The shrink swell potential is very high.

About half of the acreage is cropland or tame pasture. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. The soil is subject to surface compaction if tilled when wet and cannot be easily tilled when dry. Measures that improve tilth, help to control erosion, and conserve moisture are the main management needs in cultivated areas. Examples are minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system. Stripcropping and field windbreaks can help to control wind erosion. Contour farming, grassed waterways, and terraces help to control water erosion.

If this soil is used for range, compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth.

This soil is suited to windbreaks and environmental plantings; however, it takes in water slowly and the clayey subsoil can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIIe-4, Clayey range site.

ReA—Ree loam, 0 to 3 percent slopes. This deep, well drained, very gently sloping soil is on terraces and uplands. Areas are 15 to more than 100 acres in size and are irregular in shape. Slopes are smooth.

Typically, the surface layer is very dark grayish brown friable loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm clay loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray, loam, sandy loam, and fine sandy loam. It has accumulations of lime throughout. In places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Bon, Lane, and Oahe soils. These soils make up less than 25 percent of any one mapped area. Bon soils have dark colors that extend to a depth of more than 20 inches. They are on narrow flood plains. Lane soils contain more clay in the subsoil than the Ree soil. They are on low terraces. Oahe soils are 20 to 40 inches deep to gravelly material. They are on slight rises.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow. The shrink swell potential is moderate.

Most of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that

conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface and minimizing tillage.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Silty range site.

ReB—Ree loam, 3 to 7 percent slopes. This deep, well drained, gently sloping and undulating soil is on terraces and uplands. Areas are 10 to 100 acres in size and are irregular in shape. Slopes are slightly convex.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsoil is dark grayish brown and brown, firm clay loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light brownish gray loam, sandy loam, and fine sandy loam. It has accumulations of lime throughout. In places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Beadle, Delmont, Oahe, and Oko soils. These soils make up less than 25 percent of any one mapped area. Beadle and Oko soils are slightly higher on the landscape than the Ree soil. Also, they have more clay in the subsoil. Delmont soils are 14 to 20 inches deep to gravelly material. They are on knolls. Oahe soils are 20 to 40 inches deep to gravelly material. They are in positions on the landscape similar to those of the Ree soil.

Fertility is medium and the content of organic matter moderate in the Ree soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium. The shrink-swell potential is moderate.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system. Contour farming, terraces, and grassed waterways help to control erosion.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is IIe-1; Silty range site.

RsF—Rock outcrop-Sansarc complex, 15 to 40 percent slopes. This moderately steep and steep map unit occurs as areas where shale crops out and is intermingled with a shallow, well drained Sansarc soil. It is on the breaks along the Missouri River. It generally is dissected by narrow drainageways and gullies. The Rock outcrop is on convex slopes. The Sansarc soil is on side slopes. Landslides are common on the steeper slopes. Areas are 80 to several hundred acres in size and are irregular in shape. They are 40 to 50 percent Rock outcrop and 35 to 45 percent Sansarc soil. The Rock outcrop and the Sansarc soil occur as areas so closely intermingled or so small that mapping them separately is not practical.

The Rock outcrop is shale that has many manganese concretions throughout. It does not support vegetation.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, light olive gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

Included with the Rock outcrop and the Sansarc soil in mapping are small areas of Bullcreek and Opal soils. Bullcreek soils do not have shale within a depth of 40 inches. They are along drainageways. Opal soils are 20 to 40 inches deep over shale bedrock. They are on some of the lower side slopes.

Fertility and the content of organic matter are low in the Sansarc soil. Available water capacity is very low. Permeability is slow. Runoff is very rapid. The shrink-swell potential is very high.

The Rock outcrop does not support grazable vegetation. In all areas the Sansarc soil supports native grasses that are used for grazing. Water erosion is a hazard. Gullies form along some cattle trails. Reestablishing vegetation is difficult.

This map unit is too steep and too shallow for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Rock outcrop is in capability unit VIIIs-2 and is not assigned to a range site; the Sansarc soil is in capability unit VIIe-8, Shallow Clay range site.

SaE—Sansarc-Opal clays, 12 to 20 percent slopes. These well drained, strongly sloping and moderately steep soils are on uplands. The shallow Sansarc soil is on the upper side slopes and ridges. The moderately deep Opal soil is on the lower side slopes and less convex parts of the landscape. Areas are 50 to several hundred acres in size and are irregular in shape. They are 40 to 50 percent Sansarc soil and 25 to 35 percent Opal soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

Typically, the surface layer of the Opal soil is gray clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous clay. It has accumulations of lime throughout. Light gray shale bedrock is at a depth of about 37 inches. In some areas the depth to shale is more than 40 inches.

Included with these soils in mapping are small areas of Bullcreek and Chantier soils, Rock outcrop, and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullcreek soils are more than 40 inches deep to shale. They are along drainageways. The shallow Chantier soils contain more salts than the Sansarc soils. They are on the lower side slopes. Rock outcrop and Slickspots do not support vegetation. Rock outcrop is on convex slopes. Slickspots are on the lower foot slopes.

Fertility is low in the Sansarc soil and medium in the Opal soil. The content of organic matter is low in the Sansarc soil and moderate in the Opal soil. Tilth is poor in both soils. Available water capacity is very low in the Sansarc soil and low in the Opal soil. Permeability is slow in the Sansarc soil and very slow in the Opal soil. Runoff is rapid on both soils. The shrink-swell potential is very high.

Most of the acreage supports native grasses and is used for grazing or hay. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Establishing vegetation is difficult in denuded areas. Sites for stock water impoundments are available in some of the draws, however, seepage could be a problem.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The Sansarc soil is in capability unit VIe-12, Shallow Clay range site; the Opal soil is in capability unit VIe-4, Clayey range site.

SaF—Sansarc-Opal clays, 20 to 40 percent slopes. These well drained, moderately steep and steep soils are on the breaks along the Missouri River. The shallow Sansarc soil is on ridges and the steeper side slopes. The moderately deep Opal soil is on the lower side slopes. Slopes are mainly convex. Gullies are common. Some of the draws and north-facing slopes support stands of cedar trees. In places a few scattered glacial stones are on the surface. Areas are 100 to several hundred acres in size and are irregular in shape. They are 50 to 60 percent Sansarc soil and 15 to 25 percent Opal soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sansarc soil is grayish brown clay about 4 inches thick. The underlying material is light brownish gray, calcareous clay and very shaly clay. Light gray shale bedrock is at a depth of about 15 inches.

Typically, the surface layer of the Opal soil is gray clay about 5 inches thick. The subsoil is grayish brown, very firm clay about 17 inches thick. It is calcareous in the lower part. The underlying material is light brownish gray, mottled, calcareous clay. It has accumulations of lime throughout. Light gray shale bedrock is at a depth of about 37 inches.

Included with these soils in mapping are small areas of Bullcreek, Chantier, Gettys, and Sully soils, Rock outcrop, and Slickspots. These inclusions make up less than 25 percent of any one mapped area. Bullcreek soils are more than 40 inches deep to shale. They are along drainageways. The shallow Chantier soils contain more salts than the Sansarc soil. They are on the lower side slopes. Gettys and Sully soils are in positions on the landscape similar to those of the Sansarc soil. The deep, loamy Gettys soils formed in glacial till. The deep, silty Sully soils formed in loess. Rock outcrop and Slickspots do not support vegetation. Rock outcrop is on convex slopes. Slickspots are on the lower foot slopes.

Fertility is low in the Sansarc soil and medium in the Opal soil. The content of organic matter is low in the Sansarc soil and moderate in the Opal soil. Tilth is poor in both soils. Available water capacity is very low in the Sansarc soil and low in the Opal soil. Permeability is slow in the Sansarc soil and very slow in the Opal soil. Runoff is very rapid on both soils. The shrink-swell potential is very high.

Nearly all of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these moderately steep and steep soils unless an adequate plant cover is maintained. Establishing vegetation is difficult in denuded areas.

These soils generally are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings.

The capability unit is VIIe-8; the Sansarc soil is in Shallow Clay range site, the Opal soil in Clayey range site.

ScE—Schamber loam, 9 to 30 percent slopes. This excessively drained, strongly sloping to steep soil is on terrace scarps. It is very shallow to sandy and gravelly material. Areas are 15 to 200 acres in size and are irregular in shape. Slopes are short and convex.

Typically, the surface layer is dark grayish brown, calcareous loam about 3 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly loamy sand and gravelly sand. In

some places the surface layer is thicker. In other places it is sandy loam.

Included with this soil in mapping are small areas of Lowry, Oahe, Opal, Orton, Ree, and Sully soils. These soils make up less than 25 percent of any one mapped area. Lowry and Sully soils are below the Schamber soil on the landscape. They are not underlain by gravelly material. Oahe and Orton soils are on the less sloping side slopes. They are 20 to 40 inches deep over gravelly material. The clayey Opal soils are 20 to 40 inches deep over shale bedrock. They are on some of the lower side slopes. Ree soils are more than 40 inches deep over gravelly material. They are on the less sloping, smoother parts of the landscape.

Fertility and the content of organic matter are low in the Schamber soil. Available water capacity is very low. Permeability is rapid. Runoff is slow.

Most of the acreage supports native grasses and is used for grazing. Productivity is limited because the soil is droughty. Reestablishing vegetation is very difficult in denuded areas (fig. 7). Maintaining an adequate plant cover helps to prevent excessive erosion.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope and the droughtiness. The soil is a probable source of sand and gravel.

The capability unit is VIs-4, Very Shallow range site.

SdF—Sully silt loam, 25 to 40 percent slopes. This deep, well drained, steep soil is on uplands. Areas are 20 to 100 acres in size. They are long and narrow or are irregular in shape. Slopes are convex.

Typically, the surface layer is grayish brown silt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silt loam. It has accumulations of lime throughout. In some places the depth to lime is more

Figure 7.—An area of Schamber loam, 9 to 30 percent slopes. Revegetating is very difficult.

than 5 inches. In other places shale bedrock or shaly clay is at a depth of 20 to 60 inches.

Included with this soil in mapping are small areas of Sansarc and Schamber soils. These soils make up less than 10 percent of any one mapped area. The shallow clayey Sansarc soils are on steep side slopes below the Sully soil. Schamber soils are very shallow to gravel. They are on some ridges.

Fertility and the content of organic matter are low in the Sully soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is rapid.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope.

The capability unit is VIe-3, Thin Upland range site.

SoC—Sully-Lowry silt loams, 6 to 9 percent slopes. These deep, well drained, moderately sloping soils are on uplands. The Sully soil is on the upper, convex slopes. The Lowry soil is on the lower and smoother slopes. Areas are 15 to 100 acres in size and are irregular in shape. They are about 50 to 70 percent Sully soil and 25 to 45 percent Lowry soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sully soil is grayish brown silt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silt loam. It has accumulations of lime throughout.

Typically, the surface layer of the Lowry soil is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam. In places the soil is dark to a depth of more than 20 inches.

Included with these soils in mapping are small areas of the excessively drained Schamber soils on ridges and knolls. These included soils make up less than 10 percent of any one mapped area.

Fertility is low in the Sully soil and medium in the Lowry soil. The content of organic matter is low in the Sully soil and moderate in the Lowry soil. Tilth is good in both soils. Available water capacity is high. Permeability is moderate. Runoff is medium.

About half of the acreage is cropland. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. The high content of lime in the surface layer of the Sully soil adversely affects the availability of plant nutrients. Measures that help to control erosion and improve fertility are the main management needs in cultivated areas. Leaving crop residue on the surface and minimizing tillage are examples. Contour farming, terraces, and grassed waterways help to control erosion.

No major hazards or limitations affect the use of these soils for range; however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

These soils are suited to windbreaks and environmental plantings, but the high lime content in the surface layer of the Sully soil is a limitation. All climatically suited trees and shrubs grow well on the Lowry soil, except for those that require an abundant supply of moisture. Trees and shrubs can be established on the Sully soil, but optimum survival, growth, and vigor are unlikely. Planting on the contour helps to control erosion.

The Sully soil is in capability unit IVe-3, Thin Upland range site; the Lowry soil is in capability unit IIIe-1, Silty range site.

SoE—Sully-Lowry silt loams, 9 to 25 percent slopes. These deep, well drained, strongly sloping and moderately steep soils are on uplands. The Sully soil is on the upper, convex slopes. The Lowry soil is on the lower slopes. Slopes are mostly convex. Areas are 30 to more than 250 acres in size and are irregular in shape. They are 55 to 75 percent Sully soil and 25 to 45 percent Lowry soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sully soil is grayish brown silt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silt loam. It has accumulations of lime throughout. On some of the steeper side slopes, shale bedrock or shaly clay is at a depth of 20 to 60 inches.

Typically, the surface layer of the Lowry soil is grayish brown silt loam about 7 inches thick. The subsoil is grayish brown and brown, very friable silt loam about 13 inches thick. It is calcareous in the lower part. The underlying material to a depth of 60 inches is pale brown, calcareous silt loam and loam. In places the underlying material contains more sand.

Included with these soils in mapping are small areas of Betts, Gettys, Orton, Sansarc, and Schamber soils. These included soils make up less than 25 percent of any one mapped area. Betts and Gettys soils formed in loamy glacial till. Orton and Schamber soils are underlain by gravelly material. Sansarc soils are 4 to 20 inches deep over shale bedrock. Betts, Gettys, Sansarc, and Schamber soils are in positions on the landscape similar to those of the Sully soil. Orton soils are in the less sloping areas.

Fertility is low in the Sully soil and medium in the Lowry soil. The content of organic matter is low in the Sully soil and moderate in the Lowry soil. Available water capacity is high in both soils. Permeability is moderate. Runoff is medium.

Most of the acreage supports native grasses and is used for grazing or hay. Water erosion is a hazard on these strongly sloping and moderately steep soils unless an adequate plant cover is maintained. Reestablishing vegetation is difficult in denuded areas.

These soils generally are unsuited to cultivated crops because of the slope. They are suited to tame pasture and hay, but the high content of lime in the surface layer of the Sully soil is a limitation. The best suited pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass.

The Sully soil generally is unsuited to windbreaks and environmental plantings because of the slope. The Lowry soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well on the Lowry soil, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The Sully soil is in capability unit VIe-3, Thin Upland range site; the Lowry soil is in capability unit IVe-3, Silty range site.

SeE—Sully-Schamber complex, 9 to 25 percent slopes. These strongly sloping and moderately steep soils are on uplands. The deep, well drained Sully soil is on side slopes and the less convex ridges. The excessively drained Schamber soil is on ridges. It is very shallow to gravelly material. Areas are 10 to more than 200 acres in size and are irregular in shape. They are 60 to 70 percent Sully soil and 20 to 30 percent Schamber soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the surface layer of the Sully soil is grayish brown silt loam about 4 inches thick. The underlying material to a depth of 60 inches is brown and light yellowish brown, calcareous silt loam. It has accumulations of lime throughout.

Typically, the surface layer of the Schamber soil is dark grayish brown, very friable, calcareous loam about 3 inches thick. The underlying material to a depth of 60 inches is multicolored, calcareous gravelly loamy sand and gravelly sand. In some areas the surface layer is sandy loam.

Included with these soils in mapping are small areas of Betts, Gettys, and Sansarc soils. These included soils make up less than 20 percent of any one mapped area. Betts and Gettys soils are on some of the upper side slopes. They formed in glacial till. Sansarc soils are on some of the lower side slopes. They have shale bedrock at a depth of 4 to 20 inches.

Fertility and the content of organic matter are low in the Sully and Schamber soils. Available water capacity is high in the Sully soil and very low or low in the Schamber soil. Permeability is moderate in the Sully soil and rapid in the Schamber soil. Runoff is medium on both soils.

Most of the acreage supports native grasses and is used for grazing. Water erosion is a hazard on these strongly sloping and moderately steep soils. Productivity is limited because the Schamber soil is droughty. Reestablishing vegetation is difficult in denuded areas.

These soils generally are unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the slope. The droughtiness of the Schamber soil also is a limitation. This soil is a probable source of sand and gravel.

The Sully soil is in capability unit VIe-3, Thin Upland range site; the Schamber soil is in capability unit VIs-4, Very Shallow range site.

UaA—Uly silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas are 20 to more than 100 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface soil is grayish brown silt loam about 9 inches thick. The subsoil is brown and pale brown, friable silt loam about 14 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous silt loam. In some places the subsoil contains more clay. In other places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Mobridge and Plankinton soils. These soils make up less than 15 percent of any one mapped area. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is slow.

Most of the acreage is cropland. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that conserve moisture are the main management needs in cultivated areas. Examples are leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow

well, except for those that require an abundant supply of moisture.

The capability unit is IIc-2; Silty range site.

UaB—Uly silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uplands. Areas are 40 to more than 1,000 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface soil is grayish brown silt loam about 9 inches thick. The subsoil is brown and pale brown, friable silt loam about 14 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous silt loam. In some places the subsoil contains slightly more clay. In other places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Java, Mobridge, Plankinton, and Sully soils. These soils make up less than 15 percent of any one mapped area. Java and Sully soils are on knolls. They are shallower to lime than the Uly soil. Also, Java soils contain more sand in the subsoil, and Sully soils contain less clay throughout. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

Most of the acreage is cropland. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion and conserve moisture are the main management needs in cultivated areas. Examples are including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage. Contour farming, grassed waterways, and terraces help to control erosion.

No major hazards or limitations affect the use of this soil for range. Proper stocking rates and timely deferment of grazing or rotation grazing help to maintain maximum productivity.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is IIe-1; Silty range site.

UaC—Uly silt loam, 6 to 9 percent slopes. This deep, well drained, moderately sloping soil is on uplands. Areas are 20 to 200 acres in size and are irregular in shape. Slopes are smooth or slightly convex.

Typically, the surface soil is grayish brown silt loam about 9 inches thick. The subsoil is brown and pale brown, friable silt loam about 14 inches thick. In the lower part it is calcareous and has accumulations of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale brown and very pale brown, calcareous silt loam. In some places the subsoil contains more clay. In other places the soil contains less clay throughout.

Included with this soil in mapping are small areas of Java, Mobridge, and Sully soils. These soils make up less than 15 percent of any one mapped area. Java and Sully soils are on knolls and ridges. They are shallower to lime than the Uly soil. Also, Java soils contain more sand in the subsoil, and Sully soils contain less clay throughout. The moderately well drained Mobridge soils are in swales.

Fertility is medium and the content of organic matter moderate in the Uly soil. Tilth is good. Available water capacity is high. Permeability is moderate. Runoff is medium.

About half of the acreage is cropland. Some areas are irrigated. This soil is suited to cultivated crops and to tame pasture and hay. Examples of suitable pasture plants are alfalfa, intermediate wheatgrass, and smooth bromegrass. Measures that help to control erosion are the main management needs in cultivated areas. Including grasses and legumes in the cropping system, leaving crop residue on the surface, and minimizing tillage are examples. Contour farming, terraces, and grassed waterways help to control erosion.

No major hazards or limitations affect the use of this soil for range; however, water erosion is a hazard if the range is overgrazed. Gullies form along some cattle trails. Fencing and other means of controlling livestock traffic patterns help to prevent gullying.

This soil is suited to windbreaks and environmental plantings. All climatically suited trees and shrubs grow well, except for those that require an abundant supply of moisture. Planting on the contour helps to control erosion.

The capability unit is IIIe-1; Silty range site.

Wd—Wendte silty clay. This deep, moderately well drained, nearly level soil is on flood plains. It is subject to rare flooding. Areas are 10 to 100 acres in size and generally are long and narrow.

Typically, the surface soil is grayish brown, calcareous silty clay about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, stratified, calcareous silty clay loam and clay loam.

Included with this soil in mapping are small areas of Bullcreek and Promise soils. These soils make up less than 20 percent of any one mapped area. They are on uplands and foot slopes near the flood plains. They are not stratified.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Tilth is poor. Available

water capacity is moderate or high. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

More than half of the acreage supports native grasses and is used for grazing or hay. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Although the soil is subject to brief periods of flooding, the additional moisture is beneficial.

This soil is suited to cultivated crops. Measures that improve tilth and help to control wind erosion are the main management needs. Leaving crop residue on the surface and including grasses and legumes in the cropping system are examples. Chiseling or subsoiling improves tilth and increases the rate of water intake for a short time.

This soil is suited to tame pasture and hay. Examples of suitable pasture plants are alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass. The surface soil becomes compacted and the grass stands deteriorate if the pasture is grazed when wet. Deferred grazing during wet periods helps to prevent surface compaction.

This soil is suited to windbreaks and environmental plantings, but it takes in water slowly and the clayey underlying material can restrict the penetration of plant roots. Windbreaks can be established, but optimum growth is unlikely.

The capability unit is IIs-3; Overflow range site.

We—Wendte silty clay, channeled. This deep, moderately well drained, nearly level soil is on flood plains that are dissected into many small tracts by narrow channels. It is occasionally flooded. Areas are 20 to several hundred acres in size and are long and narrow.

Typically, the surface soil is grayish brown, calcareous silty clay about 5 inches thick. The underlying material to a depth of 60 inches is grayish brown and light brownish gray, stratified, calcareous silty clay loam and clay loam.

Included with this soil in mapping are small areas of Bon, Bullcreek, Delmont, Oahe, Promise, and Ree soils. These soils make up less than 25 percent of any one mapped area. Bon soils contain less clay throughout than the Wendte soil. They are in positions on the landscape similar to those of the Wendte soil. Bullcreek and Promise soils are on uplands and foot slopes near the flood plains. They are not stratified. Delmont, Oahe, and Ree soils are on terraces. Delmont soils are 14 to 20 inches deep over gravelly material. Oahe soils are 20 to 40 inches deep over gravelly material. The loamy Ree soils are well drained.

Fertility is medium and the content of organic matter moderate in the Wendte soil. Tilth is poor. Available water capacity is moderate or high. Permeability is slow. Runoff also is slow. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction is a problem. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Although the soil is occasionally flooded, the additional water is beneficial. Pools of water in some areas of the channels provide temporary watering places for livestock and wildlife. Native trees and shrubs provide excellent habitat for wildlife and winter protection for livestock.

This soil generally is unsuited to cultivated crops because of the meandering channels and the flooding. In areas that are accessible to farm machinery, it is suited to tame pasture and hay. Alfalfa, green needlegrass, intermediate wheatgrass, smooth bromegrass, and western wheatgrass are examples of suitable pasture plants. Debris deposited by floodwater in some years damages pasture plants and hinders haying.

This soil is suited to windbreaks and environmental plantings, but it takes in water slowly and the clayey underlying material can restrict the penetration of plant roots. Because of the meandering stream channels, trees and shrubs generally cannot be planted by machine.

The capability unit is VIw-1; Overflow range site.

Wo—Worthing silty clay loam. This deep, very poorly drained, level soil is in depressions on uplands. It is ponded during periods of snowmelt or heavy rainfall. Areas are 10 to several hundred acres in size and are irregular in shape.

Typically, the surface layer is dark gray silty clay loam about 5 inches thick. The subsoil is dark gray and gray very firm silty clay about 41 inches thick. In the lower part it is calcareous and has a few accumulations of lime. The underlying material to a depth of 60 inches is gray, calcareous silty clay. It has accumulations of lime throughout. In places the soil is not so poorly drained.

Fertility and the content of organic matter are high. Tilth is poor. Available water capacity is moderate or high. A seasonal high water table is within a depth of 1 foot. As much as 1 foot of water ponds on the surface during some wet periods. Permeability is slow. Runoff is ponded. The shrink-swell potential is high.

Most of the acreage supports native grasses and is used for grazing. Compaction and ponding are problems. Restricted grazing during wet periods helps to prevent surface compaction and deterioration of tilth. Many areas are potential sites for excavated ponds.

This soil is suited to tame pasture and hay, but the choice of plants is limited to reed canarygrass, Garrison creeping foxtail, and similar species. The soil generally is unsuited to cultivated crops and to windbreaks and environmental plantings because of the ponding. It is an excellent breeding site for waterfowl in the spring.

The capability unit is Vw-4; Shallow Marsh range site.

Wp—Worthing silty clay loam, ponded. This deep, very poorly drained, level soil is in depressions on

uplands. It is ponded most of the year. Areas are 15 to several thousand acres in size and are oval.

Typically, the surface layer is dark gray silty clay loam about 5 inches thick. The subsoil is dark gray and gray very firm silty clay about 41 inches thick. In the lower part it is calcareous and has a few accumulations of lime. The underlying material to a depth of 60 inches is gray, calcareous silty clay. It has accumulations of lime throughout.

Fertility and the content of organic matter are high. Tilth is poor. Available water capacity is moderate or high. A seasonal high water table is within a depth of 0.5 foot. As much as 3.0 feet of water ponds on the surface during some wet periods. Permeability is slow. Runoff is ponded. The shrink-swell potential is high.

Most areas support native vegetation and are used as wetland wildlife habitat (fig. 8). The native vegetation is a luxuriant stand of bulrushes, reedgrass, sedges, and cattails. Some areas are potential sites for excavated ponds.

This soil generally is unsuited to cultivated crops, tame pasture and hay, and windbreaks and environmental plantings because of the ponding.

The capability unit is VIIIw-1; no range site is assigned.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Figure 8.—An area of Worthing silty clay loam, ponded. Most areas of this soil are used as habitat for wildlife.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 33,210 acres in Brule and Buffalo Counties, or about 4 percent of the total land area, meets the soil requirements for prime farmland. This includes about 8,000 acres of irrigated land. About 299,785 additional acres would meet the requirements for prime farmland if irrigated or drained. The main crops grown on this land are corn, sorghum, oats, alfalfa, and wheat.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties [illegible] performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Eugene Waterson, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 51 percent of the acreage in Brule County and 22 percent of that in Buffalo County are used for cultivated crops or for tame pasture and hay (*3*). The major crops are alfalfa, corn, oats, grain sorghum, and wheat. Barley, sunflowers, and soybeans also are grown. Corn is grown for grain and silage; oats, sorghum, and wheat for grain; and alfalfa mainly for hay. Alfalfa, intermediate wheatgrass, and smooth bromegrass are grown for tame pasture. Alfalfa seed also is harvested as a cash crop.

The potential of the soils in the survey area for increased crop production is good. About 146,000 acres of potentially good cropland is currently used as range and 11,000 acres as pasture (*12*). Food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the survey area.

Water erosion reduces productivity and results in sedimentation in streams and lakes. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Betts and Sully soils. Erosion also reduces the productivity of soils that tend to be droughty, such as Oahe and Opal soils. When erosion occurs, sediment rich in nutrients enters the streams and lakes. Measures that control erosion minimize the pollution of streams and lakes by sediment and preserve water quality for fish and wildlife, recreation, and municipal use. They also reduce the amount of fertilizer needed in cropped areas and prevent the removal of plant nutrients.

A cropping system that keeps a plant cover on the surface for extended periods holds soil losses to an amount that does not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful

management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the water infiltration rate, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and the runoff rate and help to control erosion. They are most practical on deep, well drained soils that have long, smooth slopes. Some soils, such as Beadle and Highmore, are poorly suited to terraces and diversions because of short, irregular slopes.

Wind erosion is a slight to severe hazard on many of the soils in the survey area. The hazard is especially severe on Betts and Sully soils. Wind erosion can damage these soils in a few hours if winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. An adequate plant cover, a cover of crop residue, and a rough surface help to control wind erosion. Windbreaks of suitable trees and shrubs also are effective.

Information about the measures that control erosion on each kind of soil is contained in the Technical Guide, available in the local office of the Soil Conservation Service.

Soil fertility helps to determine the yields that can be obtained from the soil. It can be improved by applying fertilizer and by including grasses and legumes in the cropping system. The kinds and amounts of fertilizer needed on Java and other soils that have a high content of lime in the surface layer generally differ from the kinds and amounts needed on soils that do not have lime in the surface layer. On all soils, additions of fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected yield level. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer needed.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. In Millboro, Promise, and Wendte soils, tilth is poor. These soils dry out slowly in the spring and cannot be easily tilled when dry. If they are farmed when wet, they tend to be cloddy when dry. As a result of the cloddiness, preparing a seedbed is difficult. Timely tillage, inclusion of grasses and legumes in the cropping system, and incorporation of crop residue into the soil improve tilth and increase the rate of water intake.

Field crops suited to the soils and climate of the survey area include close-grown crops and row crops. Oats and wheat are the main close-grown crops. Corn and sorghum are the main row crops.

The deep, well drained or moderately well drained soils are suited to all of the crops commonly grown in the survey area. Examples are Bon, Glenham, Highmore, Mobridge, and Uly soils. Oahe and other droughty soils are better suited to early maturing small grain than to the deeper rooted crops, such as corn and alfalfa, because the porous underlying material limits the depth to which roots can penetrate and the available water capacity. Sully and other soils that are susceptible to wind erosion are better suited to close-grown crops than to other crops.

Many of the deep, well drained soils are suited to irrigation. Examples are Highmore, Lowry, Ree, and Uly soils. The main concerns of management are conserving moisture and improving fertility and tilth in all irrigated soils and controlling erosion on soils that have a slope of more than 2 percent. The quality of the irrigation water is a concern if water from a well is used. The best water has a low content of salts and sodium.

Pasture plants best suited to the climate and most of the soils in the survey area include alfalfa, intermediate wheatgrass, and smooth bromegrass. Because of the hazard of erosion, bunchgrasses, such as crested wheatgrass, should not be planted in areas where the slope is more than 6 percent. On the poorly drained Kolls and Plankinton soils, the choice of pasture plants is limited to water-tolerant species, such as Garrison creeping foxtail and reed canarygrass.

If the pasture is overgrazed, the grasses lose vigor and die and usually are replaced by annual grasses and weeds. Proper stocking rates, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in table 6.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*10*). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-4. The capability units are not numbered consecutively because not all of the units in the statewide system are represented in the county.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 6.

Rangeland

Arnold G. Mendenhall, resource conservationist, Soil Conservation Service, prepared this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes land revegetated to native plants. The vegetation consists mainly of grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation grown in any one area are determined by the soil, topography, climate, past use, and management.

All of the survey area was rangeland before the first permanent settlers arrived. Today, approximately 75 percent of Buffalo County and 44 percent of Brule County support native vegetation. This rangeland supplies a major portion of the forage for livestock in the area. Approximately 70 percent of the farm and ranch income in the survey area is derived from the sale of livestock. Most of the ranches are cow-calf operations. Some are yearling operations; however, some ranchers combine their cow herds with yearlings. This practice permits greater flexibility in adjusting livestock numbers during periods of drought. The rangeland generally is grazed from May through October. The forage provided by rangeland generally is supplemented by crop aftermath and tame pasture plants, such as crested wheatgrass and smooth bromegrass. In winter it is supplemented by protein concentrate and hay.

Brule and Buffalo Counties are part of the mixed grass prairie (*8*). The native vegetation is dominated by mid grasses and forbs, but tall and short grasses and forbs are also mixed in with these plants. The mixed grass prairie consists of cool- and warm-season plants, which provide good quality forage throughout the growing

season. The cool-season plants grow mostly during April, May, and June and the warm-season plants during June, July, and August. The cool-season grasses may start growing again in September and October if fall rains are adequate.

The native vegetation in some parts of the survey area is producing below its potential because of past misuse. The tall grasses and some mid grasses have been reduced in abundance and have been replaced by less desirable plants. In many areas the tall and mid warm-season grasses have been replaced by cool-season grasses because of continual overuse during the prime growing season of the warm-season plants. An imbalance of cool-season grasses to warm-season grasses is the result. In most areas, however, enough of the original plants remain for good grazing management to reestablish the high quality plants.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map.

The plants within the native plant community are sometimes grouped or classed as decreasers, increasers, or invaders based on their response to grazing pressure. *Decreasers* are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. *Increasers* are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by grazing animals. *Invaders* are plants that are not part of the original plant community but invade the plant community because of some kind of disturbance or continued overgrazing. Some invader plants have little value for grazing. Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the more preferred warm-season plants. Grazing only in spring would cause the warm-season plants to increase in abundance, and summer grazing would cause the warm-season plants to decrease.

Table 7 shows, for nearly all the soils, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the range to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to maintain the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for that site. Four range condition classes are recognized. The range site is in excellent condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation, in good condition if the percentage is 51 to 75, in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less. The productivity of rangeland depends on the range site, the range condition, and the moisture available to plants during the growing season.

Range management that maintains or improves the range condition is needed on all rangeland in the survey area. Proper stocking rates and rotation grazing or deferred grazing programs, which allow for the proper sequence of grazing and provide rest periods, maintain or improve the vigor of the key plants. Proper range management also includes range seeding, fencing, and measures that provide water for livestock. Contour furrowing, pitting, deep chiseling, and other kinds of mechanical treatment are needed on some range sites.

There are 17 range sites in the survey area. They are Clayey, Claypan, Closed Depression, Dense Clay, Overflow, Saline Lowland, Sandy, Shallow, Shallow Clay, Shallow to Gravel, Shallow Marsh, Silty, Subirrigated, Thin Claypan, Thin Upland, Very Shallow, and Wetland. At the end of each map unit description, the soils are assigned to an appropriate range site. The paragraphs that follow describe the range sites in the survey area.

Clayey range site. The potential native vegetation on this site is mid and short prairie grasses interspersed with a variety of forbs. Green needlegrass and western wheatgrass, which are cool-season grasses, make up about 65 percent of the vegetation. Warm-season grasses make up 30 percent, as follows: sideoats grama, little bluestem, and big bluestem—20 percent, blue grama and buffalograss—10 percent. Forbs, such as heath aster, prairie coneflower, yarrow, sageworts, false boneset, and scarlet globemallow, make up about 5 percent.

The major management concern on this site is maintaining the most productive grasses. Green needlegrass, sideoats grama, little bluestem, and big bluestem rapidly lose their productive capacity after continued overgrazing because the livestock prefer these plants. The amount of western wheatgrass initially increases after overuse. It decreases, however, if overuse continues. After continued overgrazing, the amount of blue grama and buffalograss increases and that of the taller grasses decreases. A less productive short-grass site is the result. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Claypan range site. The potential native vegetation on this site is mid and short prairie grasses interspersed with some forbs. Cool-season grasses make up about 65 percent of the vegetation, as follows: western wheatgrass—45 percent, green needlegrass—15 percent, and needleandthread—5 percent. Blue grama, buffalograss, and sideoats grama, which are warm-season grasses, make up about 25 percent of the vegetation. Blue grama is the dominant warm-season grass. Sedges, which are grasslike plants, and forbs make up the other 10 percent.

The major management concern on this site is maintaining the most productive grasses. The amount of green needlegrass, western wheatgrass, needleandthread, and sideoats grama rapidly decreases after continuous overgrazing because the livestock prefer these plants. The amount of blue grama and buffalograss increases as that of the other grasses decreases. Less forage production is the result. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Closed Depression range site. The potential native vegetation on this site is dominantly western wheatgrass, 85 percent, and sedges, 10 percent. The plant community is not stable, however, because of alternating wet and dry periods. The site, which is on the flat or concave bottoms of closed depressions, is excessively wet or ponded during wet periods and is droughty during abnormally dry periods.

The major management concern on this site is maintaining the most desirable plant community. Continued overgrazing reduces the amount of western wheatgrass, and trampling by livestock aggravates the poor drainage of the site. After overgrazing, the amount of short grasses, such as saltgrass and Kentucky bluegrass, increases and that of western wheatgrass decreases. A less productive site is the result. The most productive grasses can be maintained by using the proper stocking rates along with timely deferment of grazing, which provides rest periods during the growing seasons of the desired plants and when the site is wet.

Dense Clay range site. The potential native vegetation on this site is mid prairie grasses interspersed with forbs. Western wheatgrass and green needlegrass, which are cool-season grasses, make up about 90 percent of the vegetation. Forbs, such as wild onion, make up about 10 percent. This site does not have an understory of short grasses.

The major management concern on this site is maintaining the productivity of the green needlegrass and western wheatgrass. After continued overgrazing, these two grasses thin out and are replaced by invaders or the soil is bare and highly susceptible to erosion. The green needlegrass and western wheatgrass can be maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these grasses.

Overflow range site. The potential native vegetation on this site is mixed prairie grasses. Big bluestem, a tall warm-season grass, makes up about 55 percent of the vegetation. Other warm-season, tall and mid grasses, such as switchgrass, indiangrass, little bluestem, and sideoats grama, make up 20 percent. Green needlegrass and western wheatgrass, which are cool-season grasses, make up 20 percent, and leadplant and sedges make up about 5 percent.

The major management concern on this site is maintaining the most productive grasses. Big bluestem, switchgrass, green needlegrass, indiangrass, and little bluestem rapidly lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the amount of these plants decreases,

the amount of western wheatgrass and sideoats grama initially increases. After continuous overgrazing, however Kentucky bluegrass, a short cool season grass, increases in abundance and becomes the principal plant on the site. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Saline Lowland range site. The potential native vegetation on this site is salt-tolerant plants. Prairie cordgrass, western wheatgrass, and Nuttall alkaligrass make up about 70 percent of the vegetation. Alkali sacaton and switchgrass make up about 10 percent. Inland saltgrass, sedges, and forbs make up about 20 percent.

The major management concern on this site is maintaining the most productive plants. After continuous overgrazing, the most preferred and productive grasses lose vigor and thin out. Inland saltgrass is then able to increase in abundance and soon becomes the principal grass on the site. Because inland saltgrass is unpalatable and productivity is low, this site loses its capacity to produce quality forage for livestock. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Sandy range site. The potential native vegetation on this site is mixed prairie grasses. Little bluestem, sand bluestem, and prairie sandreed, which are warm-season grasses, make up about 60 percent of the vegetation. Needleandthread and western wheatgrass, which are cool season grasses, make up about 20 percent. Sideoats grama and blue grama make up about 10 percent. Forbs, such as heath aster, scurfpea, and sagewort, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. The amount of sand bluestem and little bluestem decreases after continuous grazing because the livestock prefer these plants. The amount of prairie sandreed, needleandthread, and sideoats grama initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grama and Kentucky bluegrass. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow range site. The potential native vegetation on this site is dominantly warm-season prairie grasses. These grasses make up about 80 percent of the vegetation, as follows: little bluestem—40 percent; sideoats grama—25 percent, big bluestem—10 percent, and blue and hairy grama—5 percent. Cool-season grasses, such as needleandthread and western wheatgrass, make up about 10 percent of the vegetation. Other plants, such as sedges, forbs, and shrubs, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem and big bluestem rapidly lose their productive capacity after continuous grazing because the livestock prefer these plants. The amount of needleandthread and sideoats grama initially increases after continuous grazing. It decreases, however, after continuous overgrazing. As the amount of these grasses decreases, blue and hairy grama increase in abundance. Low forage production is the result. The most productive grasses can be maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow Clay range site. The potential native vegetation on this site is mixed prairie grasses. Warm-season grasses make up about 55 percent of the vegetation, as follows: little bluestem—30 percent, sideoats grama—10 percent, big bluestem—10 percent, and blue grama—5 percent. Western wheatgrass and green needlegrass, which are cool-season grasses, make up about 35 percent of the vegetation. Sedges and forbs make up the other 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem, big bluestem, and green needlegrass rapidly lose their productive capacity after continuous grazing because the livestock prefer these plants. The amount of western wheatgrass and sideoats grama initially increases after continuous grazing. It decreases, however, after continuous overgrazing. As a result, the amount of blue grama and other less productive forage plants increases. The most productive plants can be maintained by using proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow Marsh range site. This site is ponded in spring and early in summer. The potential native vegetation on this site is water-tolerant, tall prairie grasses and sedges. Rivergrass and slough sedge make up about 70 percent of the vegetation. American mannagrass, common spikesedge, prairie cordgrass, and reedgrass make up about 20 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent.

The major management concern on this site is maintaining the most productive plants. After continued

overgrazing, rivergrass and slough sedge decrease in abundance and are replaced by spikesedge and other grasslike plants. An increase in the abundance of less palatable vegetation results in a loss of usable forage. The most productive plants can be maintained by using the proper stocking rates along with a deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Shallow to Gravel range site. The potential native vegetation on this site is mid prairie grasses. Cool-season grasses make up about 50 percent of the vegetation, as follows: needleandthread, 40 percent, and western wheatgrass, 10 percent. Warm-season grasses make up about 40 percent, as follows: little bluestem, plains muhly, sideoats grama, and prairie dropseed—20 percent and blue grama and hairy grama—20 percent. Sedges, forbs, and shrubs make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Needleandthread, western wheatgrass, little bluestem, plains muhly, sideoats grama, and prairie dropseed rapidly thin out after continuous overgrazing. When the amount of these grasses decreases, the amount of sedges, blue grama, and hairy grama increases. If overgrazing continues, bare spots are interspersed with the grasses and the productivity of the site is greatly reduced. The most productive grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Silty range site. The potential native vegetation on this site is mixed prairie grasses. Cool-season grasses make up about 55 percent of the vegetation. They are dominantly green needlegrass and western wheatgrass and lesser amounts of needleandthread and porcupinegrass. Warm-season grasses, such as little bluestem, big bluestem, prairie dropseed, sideoats grama, and blue grama, make up about 35 percent of the vegetation. Forbs, such as the sageworts, heath aster, false boneset, and shrubs, such as leadplant, rose, and western snowberry, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. After continuous grazing, the amount of bluestems, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. The amount of western wheatgrass and needleandthread initially increases after continuous grazing. After continuous overgrazing, however, short grasses, such as blue grama and Kentucky bluegrass, become the dominant plants. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program which provides rest periods during the key growing seasons of the desired plants.

Subirrigated range site. The potential native vegetation on this site is dominantly tall, warm season grasses. Big bluestem, the dominant warm-season grass, makes up about 60 percent of the vegetation. Switchgrass, indiangrass, and little bluestem make up about 20 percent. Western wheatgrass, sedges, and bluegrasses make up about 10 percent. Forbs, such as Maximilian sunflower, showy milkweed, and Missouri goldenrod, make up about 10 percent.

The major management concern on this site is maintaining the most productive tall grasses. After continuous grazing, the amount of big bluestem, indiangrass, and switchgrass decreases and that of western wheatgrass, sedges, and Kentucky bluegrass increases. After continuous overgrazing, Kentucky bluegrass, inland saltgrass, annual grasses, and weeds occupy the site. Very low forage production is the result. The most productive tall grasses can be maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Thin Claypan range site. The potential native vegetation on this site is a mixture of mid and short grasses. Western wheatgrass is the dominant cool-season grass. It makes up about 40 percent of the vegetation. Short, warm-season grasses, such as blue grama and buffalograss, make up about 40 percent. Inland saltgrass and sedges make up about 10 percent, and forbs, such as sagewort, heath aster, and broom snakeweed, make up about 10 percent.

The major management concern on this site is maintaining the western wheatgrass. After continued overgrazing, this grass thins out and is replaced by blue grama, buffalograss, pricklypear, and saltgrass. If overgrazing continues, large bare areas are interspersed with the grasses, especially during dry periods, and weeds are common during wet periods. The western wheatgrass can be improved or maintained by using the proper stocking rates along with a deferred grazing program, which provides rest periods during the key growing seasons of the desired plants.

Thin Upland range site. The potential native vegetation on this site is mixed prairie grasses. Warm-season grasses make up 70 percent of the vegetation as follows: little bluestem—40 percent, sideoats grama, big bluestem, and plains muhly—20 percent, and blue grama—10 percent. Cool-season grasses, such as green needlegrass, western wheatgrass, and needleandthread, make up about 20 percent of the vegetation. Forbs, such as pasqueflower and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. Little bluestem, big bluestem, green needlegrass, and plains muhly lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The amount of western wheatgrass, sideoats grama, and needleandthread initially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site. Low forage production is the result. The most productive grasses can be improved or maintained by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. Needleandthread, the dominant mid grass, makes up about 30 percent of the vegetation. Short grasses, such as blue grama and hairy grama, make up about 30 percent. Sedges, such as threadleaf sedge, make up about 20 percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, and shrubs, such as leadplant and small soapweed, make up about 20 percent.

The main management concern on this site is maintaining a good stand of grass. After overgrazing, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is bare and subject to erosion. A productive grass cover can be maintained on the site by using the proper stocking rates along with a deferred grazing or rotation grazing program, which provides rest periods during the key growing seasons of the desired plants.

Wetland range site. The potential native vegetation on this site is grasses and sedges that can tolerate wetness. A high water table rises above the surface for short periods during spring. Prairie cordgrass makes up about 60 percent of the vegetation. Western wheatgrass makes up about 20 percent. Nuttall alkaligrass and inland saltgrass make up about 10 percent. Sedges and forbs make up about 10 percent.

The major management concern on this site is maintaining the most productive grasses. After continued overgrazing, the amount of the most productive grasses decreases and that of sedges, rushes, Kentucky bluegrass, and inland saltgrass increases. Productivity is lower because of the increase in the amount of the shorter, less palatable plants. The most productive grasses can be improved or maintained by using the proper stocking rates along with a rotation grazing or deferred grazing program, which provides rest periods during the key growing seasons of these plants.

Native Woods, Windbreaks, and Environmental Plantings

Native trees and shrubs grow on about 2,000 acres in the survey area. They generally grow on flood plains along the larger drainageways and on breaks along the deeper drainageways. Some grow along the margins of Red Lake and some of the larger depressions. The soils that support trees are not classified as woodland soils. Nearly all of the wooded areas provide habitat for wildlife and protection for domestic animals.

Scattered individual plants or clumps of American elm, American plum, boxelder, bur oak, common chokecherry, hackberry, green ash, and western snowberry are common on the Bon, Lane, and Wendte soils on flood plains. Plains cottonwood and peachleaf willow commonly grow adjacent to stream channels and less commonly on the margins of the areas of Worthing and Plankinton soils in depressions. Boxelder, bur oak, and green ash grow on the Betts, Java, Gettys, and Opal soils in drainageways. Eastern redcedar grows on some north-facing slopes of the Missouri River breaks.

Windbreaks have been planted since the days of the early settlers. The early windbreaks were planted mainly to protect farmsteads and livestock. These kinds of windbreaks are still needed. In recent years field windbreaks have been planted to help control wind erosion. They are still needed in many areas.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Grazing is extremely damaging to windbreaks and environmental plantings because the livestock compact the soil and remove the lower branches of the trees and shrubs. Removal of the lower branches reduces the effectiveness of the windbreaks. Grasses and weeds prevent maximum growth. Clean cultivation and applications of herbicide help to control weeds (fig. 9). Fallowing a year before planting helps to provide a reserve supply of moisture, which is needed before seedings can be established.

The effectiveness of many of the older windbreaks in the survey area can be improved by planting ponderosa

Figure 9.—Excellent weed control in a windbreak on Uly silt loam, 0 to 2 percent slopes.

pine eastern redcedar, or Rocky Mountain juniper between the existing rows. Also, additional trees can be planted on the edges of the existing belts.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height duration, intensity, and frequency of flooding is essential

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome *Moderate* means that limitations can be overcome or alleviated by planning design or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but

remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Connie M. Vicuna, biologist, Soil Conservation Service, helped prepare this section.

Wildlife habitat in Brule and Buffalo Counties is primarily provided by rangeland, cropland, and scattered areas of shallow wetlands. The game species include ring-necked pheasant, sharp-tailed grouse, eastern cottontail, whitetail jackrabbit, red fox, coyote, whitetail deer, and mule deer. Numerous species of ducks and geese migrate through the survey area. Fish are abundant in Lake Sharpe and Lake Francis Case.

The distribution and density of wildlife in the survey area are related to the presence or absence of various habitat elements that provide sources of food and cover. These habitat elements include cropland, grasses and forbs, shrubs, trees, wetlands, rivers, and other water bodies. The general abundance of these habitat elements commonly corresponds to soil associations or groups of associations because each association has a distinctive pattern of soils, relief, and drainage that results in characteristic vegetation and land use patterns. In the following paragraphs, the 14 soil associations described under the heading "General Soil Map Units" are grouped into wildlife areas that differ in the kinds and abundance of wildlife, in the potential for producing habitat elements, and in other environmental factors.

Wildlife area 1 makes up about 62 percent of the survey area. It consists of the Beadle-Plankinton-Eakin, Eakin-DeGrey, Glenham-Java-Highmore, Highmore-Mobridge, Highmore-Java-Glenham, and Oahe-Delmont associations. The amount of cropland ranges from about 75 percent in the Highmore-Mobridge association to 20 percent in the Oahe-Delmont association. Alfalfa, corn, grain sorghum, and small grain are the main crops. The main kinds of wildlife that inhabit this area are gray partridge, eastern cottontail, western meadowlark, mourning dove, and ring-necked pheasant.

Shallow wetlands, which occur as areas of the Plankinton and Worthing soils, provide excellent habitat for migrating waterfowl in the spring. In wetter years they also provide nesting areas for waterfowl. Large wetland areas, such as Red Lake, and stock water impoundments also provide habitat for waterfowl in most years. Mallard, blue-winged teal, shoveler, American widgeon, pintail, mink, muskrat, and great blue heron are among the species that inhabit these areas.

Planted windbreaks provide most of the available woody cover. Native trees and shrubs that grow along Smith Creek and other small drainageways also provide some woody cover. Grassy cover is available around most wetlands and in areas of the Beadle-Plankinton-Eakin and Oahe-Delmont associations. Rangeland wildlife species that inhabit this area include lark bunting, sharp-tailed grouse, and whitetail jackrabbit. Deer are most abundant near the wooded areas and around Red Lake and other large wetland areas. Predators, such as red fox, coyote, badger, skunk, and raccoon, are throughout this wildlife area. Wildlife habitat can be improved by planting trees and shrubs and leaving undisturbed grassy areas.

Wildlife area 2 makes up about 8 percent of the survey area. It consists of the Lowry-Sully and Uly associations. The amount of cropland is about 60 percent in the Lowry-Sully association and 90 percent in the Uly association. Some of the cropland is irrigated. The main wildlife species are gray partridge, eastern cottontail, mourning dove, and ring-necked pheasant. This area also attracts migrating waterfowl because of its proximity to the Missouri River. Deer frequently forage in cropland areas near the Missouri River breaks. Predators include coyote, red fox, badger, skunk, and the prairie rattlesnake.

The steeper areas of the Sully soils on the breaks along the Missouri River are used primarily for range. They provide most of the natural cover in this area. Also, several state game production areas provide excellent wildlife habitat.

Wildlife area 3 makes up about 15 percent of the survey area. It consists of the Betts-Java, Okaton, and Sansarc-Opal-Chantier associations. Nearly all of this area is range. Because of the slope and the shallow depth to shale in some areas, most of the soils generally are suited only to range. Areas of shale outcrop are interspersed with the range. They do not support vegetation. The deep draws support thick stands of woody plants. American, Crow, Elm, Little Elm, Soldier, and Campbell Creeks are in this area. Mule deer, whitetail deer, and bobcat inhabit the breaks along the Missouri River. The western magpie inhabits cedar

thickets in the draws. The flood plains provide habitat for beaver, wild turkey, cottontail rabbits, red fox, and a variety of songbirds. This area has a large concentration of coyotes. The prairie rattlesnake also is common, especially near prairie dog towns.

Wildlife area 4 makes up about 1 percent of the survey area. It is the Durrstein-Egas association on flood plains dissected by stream channels. Only about 5 percent of this area is cultivated. Most of the acreage is range or hayland. The grass cover is sparse because of saline soil characteristics and compaction caused by livestock. Wildlife species common to this area are the upland plover, killdeer, sharp-tailed grouse, mourning dove, and whitetail jackrabbit.

Open water areas in the stream channels provide habitat for wetland wildlife. Mallards, blue-winged teal, and red-winged blackbirds nest along the channels. Great blue herons also inhabit these water areas.

Wildlife area 5 makes up about 14 percent of the survey area. It consists of the Opal, saline-Promise and Promise-Opal associations. Most of the Opal, saline-Promise association is range, and about 40 percent of the Promise-Opal association is range. Alfalfa, small grain, and sorghum are the main crops. Parts of Crow, Elm, Smith, and Soldier Creeks are in this area. Sharp-tailed grouse, lark bunting, meadowlark, whitetail jackrabbit, and prairie dogs are the main wildlife species in this area. Deer, turkey, eastern cottontail, songbirds, and red fox inhabit the wooded areas on some flood plains.

Grouping the associations into these wildlife areas provides a broad indication of the potential for managing the wildlife habitat in the counties. When habitat development and management for a specific site are planned, the capabilities of the individual soils on the site should be considered. Individual soils have different potentials for development and maintenance of the wildlife habitat elements. The soil, therefore, affects the degree or extent to which wildlife habitat can be established or improved. In table 10 the soils in the survey area are rated according to their potential for providing each of the wildlife habitat elements. The ratings, as described in the following paragraphs, indicate the ease of establishing or maintaining these elements.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, hawthorn, and dogwood. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control

structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Information concerning the elements needed to maintain and manage specific wildlife species can be obtained from the local office of the Soil Conservation Service or from the South Dakota Department of Game, Fish and Parks.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high

water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons (aerobic) are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic

layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts,

are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

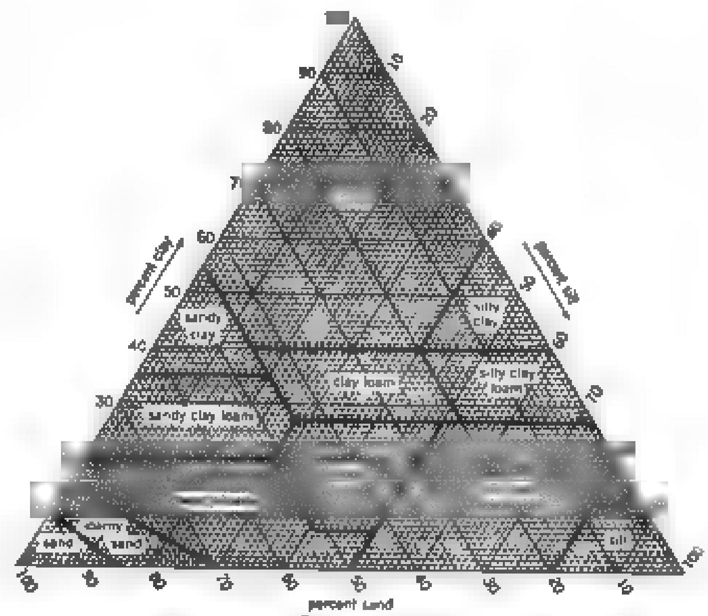

Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content

of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet

and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in this survey area range from 0.10 to 0.43. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days.

Probable dates are expressed in months. November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the South Dakota Department of Transportation, Division of Highways.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning intermittent dryness, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplustolls (*Hapl*, meaning minimal horizonation, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*9*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*11*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Artesian Series

The Artesian series consists of deep, somewhat poorly drained soils formed in silty and clayey alluvium in upland basins. Permeability is slow. Slopes are less than 1 percent.

Artesian soils commonly are near Bon, Farmsworth, Lane, and Worthing soils. The moderately well drained Bon and Lane soils are slightly higher on the landscape than the Artesian soils. Farmsworth soils have a natric horizon. They are in positions on the landscape similar to those of the Artesian soils. The very poorly drained Worthing soils are in depressions.

Typical pedon of Artesian silty clay loam, 805 feet east and 1,980 feet north of the southwest corner of sec. 19, T. 103 N., R. 70 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic; mildly alkaline; abrupt smooth boundary.

Bw1—5 to 10 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; few fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; mildly alkaline; abrupt wavy boundary.

Bw2—10 to 17 inches; gray (10YR 5/1) silty clay, very dark grayish brown (2.5Y 3/2) moist; few fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; shiny surfaces on some peds; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

BCzg—17 to 31 inches; gray (N 5/0) silty clay, very dark grayish brown (2.5Y 3/2) moist; few fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; few tongues of dark gray (10YR 4/1) material; shiny surfaces on some peds; common fine nests of salts; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Czg—31 to 40 inches; light brownish gray (2.5Y 6/2) and dark grayish brown (2.5Y 4/2) silty clay, dark grayish brown (2.5Y 4/2) and very dark gray (10YR 3/1) moist; massive; extremely hard, very firm, very sticky and very plastic; common fine nests of salts; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cg1—40 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent light olive brown (2.5Y 5/4) and black (5Y 2/1) mottles; massive; very hard, firm, sticky and plastic; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cg2—50 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent light olive brown (2.5Y 5/4) and black (5Y 2/1) mottles; massive; very hard, firm, sticky and plastic; common fine to coarse accumulations of carbonate; strong effervescence.

The thickness of the solum ranges from 24 to 36 inches. The thickness of the mollic epipedon ranges from 24 to 42 inches. The depth to free carbonates ranges from 4 to 14 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It ranges from slightly acid to mildly alkaline. The Bw horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It ranges from neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 to 3. It is mildly alkaline or moderately alkaline.

Beadle Series

The Beadle series consists of deep, well drained soils formed in clay loam glacial till on uplands. Permeability is moderately slow. Slopes range from 1 to 9 percent.

Beadle soils are similar to Oko soils and commonly are near DeGrey, Eakin, Highmore, Jerauld, Plankinton, and Worthing soils. DeGrey and Jerauld soils have a natric horizon. They are in small depressions. Eakin and Highmore soils contain less clay and more silt in the subsoil than the Beadle soils. They are in positions on the landscape similar to those of the Beadle soils. Oko soils contain more clay in the subsoil than the Beadle soils. The poorly drained Plankinton soils and the very poorly drained Worthing soils are in depressions.

Typical pedon of Beadle loam, in an area of Beadle-Jerauld complex, 1 to 5 percent slopes, 70 feet south and 900 feet east of the northwest corner of sec. 33, T. 101 N., R. 68 W.

A—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky; common very fine roots; neutral; clear smooth boundary.

Bt—6 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and medium dark gray (10YR 4/1) tongues of the A horizon; common very fine roots; neutral; gradual wavy boundary.

BCk1—12 to 16 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and slightly plastic; few fine and medium dark gray (10YR 4/1) tongues of the A horizon; common fine and medium accumulations of

carbonate; common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

BCk2—16 to 23 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct reddish yellow (7.5YR 6/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and slightly plastic; few fragments of shale; many medium accumulations of carbonate; common very fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—23 to 33 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct reddish yellow (7.5YR 6/6) mottles; massive; very hard, firm, sticky and slightly plastic; few fragments of shale; many moderate accumulations of carbonate; few fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C1—33 to 49 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct reddish yellow (7.5YR 6/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fragments of shale; few fine and medium accumulations of carbonate; few very fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—49 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct gray (10YR 6/1) and few fine distinct reddish yellow (7.5YR 6/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few shale chips; common fine nests of gypsum; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 21 to 29 inches. The depth to free carbonates is 12 to 15 inches. The thickness of the mollic epipedon also is 12 to 15 inches.

The A horizon has value of 4 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. The mottles are inherited from the parent material.

Betts Series

The Betts series consists of deep, well drained soils formed in calcareous, loamy glacial till on uplands. Permeability is moderate in the upper part of the profile and moderately slow in the underlying material. Slopes range from 9 to 40 percent.

Betts soils are similar to Gettys and Java soils [redacted] commonly are near Glenham, Java, and Schamber soils. Gettys soils contain more clay throughout than the Betts soils. Glenham and Java soils have a mollic epipedon. Glenham soils generally are on the less sloping parts of the landscape. Schamber soils have gravelly material within a depth of 10 inches. They are in positions on the landscape similar to those of the Betts soil.

Typical pedon of Betts loam (fig. 11), in an area of Betts-Java loams, 20 to 40 percent slopes, 90 feet north and 750 feet east of the southwest corner of sec. 24, T. 108 N., R. 70 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; many very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

ACk—3 to 8 inches; light brownish gray (10YR 6/2) clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; common very fine roots; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—8 to 25 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—25 to 40 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; few fine distinct brownish yellow (10YR 6/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine fragments of shale; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 52 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) moist; few fine distinct brownish yellow (10YR 6/6) mottles; hard, friable, slightly sticky and slightly plastic; few fragments of shale; few fine and medium nests of gypsum; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—52 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct olive (5Y 4/4) mottles; massive; hard, friable, slightly sticky; common medium and coarse nests of gypsum; strong effervescence; moderately alkaline.

The solum is less than 10 inches thick. Typically, free carbonates are at the surface, but some pedons are leached to a depth of 3 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It ranges from neutral to moderately

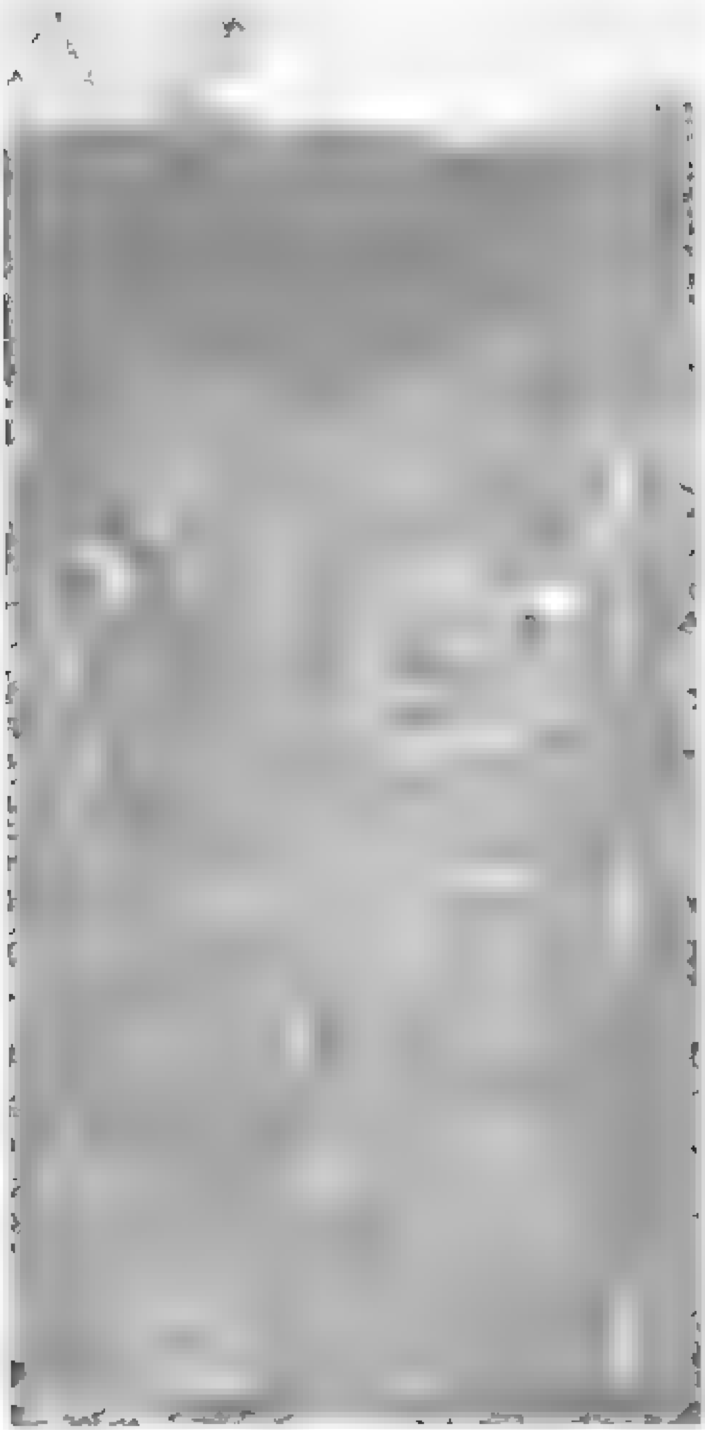

Figure 11.—Profile of Betts loam. The surface layer is about 3 inches thick.

alkaline. Some pedons have a loam or clay loam Bw horizon that has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is loam or clay loam. The mottles are inherited from the parent material.

Bon Series

The Bon series consists of deep, well drained and moderately well drained soils formed in alluvium on terraces and flood plains. Permeability is moderate. Slopes range from 0 to 2 percent.

Bon soils commonly are near Durrstein, Egas, Lane, Oahe, and Ree soils. The poorly drained Durrstein and Egas soils contain more salts throughout than the Bon soils. They are on the low parts of the flood plains. Lane soils contain more clay throughout than the Bon soils. They are in positions on the landscape similar to those of the Bon soils. Oahe and Ree soils are slightly higher on the landscape than the Bon soils. Oahe soils are 20 to 40 inches deep to gravelly material. Ree soils have an argillic horizon.

Typical pedon of Bon loam, 640 feet east and 1,290 feet north of the southwest corner of sec. 8, T. 105 N., R. 67 W.

A1—0 to 3 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common very fine roots; neutral; clear smooth boundary.

A2—3 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common very fine roots; neutral; clear wavy boundary.

A3—14 to 23 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable; common very fine roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

A4—23 to 28 inches, dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak coarse and medium subangular blocky structure; slightly hard, very friable; common very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C1—28 to 41 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, firm, slightly sticky; few very fine roots; few fine accumulations of salts; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C2—41 to 51 inches, light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist;

massive; slightly hard, firm; slightly sticky; few very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—51 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, firm, slightly sticky; few very fine roots; common fine and few medium accumulations of carbonate; strong effervescence; moderately alkaline.

The depth to free carbonates ranges from 0 to 20 inches. The thickness of the mollic epipedon ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It dominantly is loam but in some pedons is silt loam. It ranges from neutral to moderately alkaline. The C horizon has value of 3 to 7 (2 to 5 moist) and chroma of 1 to 3. It is stratified fine sandy loam, loamy fine sand, silt loam, silty clay loam, or clay loam. It is mildly alkaline or moderately alkaline. Mottles are below a depth of 30 inches in some pedons.

Bullcreek Series

The Bullcreek series consists of deep, moderately well drained soils formed in clayey alluvium in valleys, on fans, and on low terraces. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 0 to 4 percent.

Bullcreek soils commonly are near Hurley, Opal, Promise, and Sansarc soils. Hurley and Promise soils are in positions on the landscape similar to those of the Bullcreek soils. Hurley soils have a natric horizon. Opal and Promise soils are not so dense as the Bullcreek soils. Also, Opal soils are slightly higher on the landscape. They are 20 to 40 inches deep to shale. Sansarc soils are 4 to 20 inches deep to shale. They are on ridges and on the sides of drainageways.

Typical pedon of Bullcreek clay, 500 feet south and 125 feet east of the northwest corner of sec. 11, T. 106 N., R. 69 W.

A—0 to 2 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; hard, firm, sticky and plastic; common fine roots; mildly alkaline; clear smooth boundary.

Bw—2 to 12 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; extremely hard, firm, sticky and plastic; few fine roots; strongly alkaline; gradual wavy boundary.

Bz—12 to 24 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; extremely hard, firm, sticky and plastic; many fine and medium nests of gypsum and other salts; few fine roots; moderately alkaline; gradual wavy boundary.

C1—24 to 42 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; common fine and medium nests of gypsum and other salts; strongly alkaline; gradual wavy boundary.

C2—42 to 51 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; many fine to coarse nests of gypsum and other salts; strongly alkaline; gradual wavy boundary.

C3—51 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; moderately alkaline.

The thickness of the solum ranges from 10 to 24 inches. Free carbonates are at the surface in some pedons. Visible salts are within a depth of 20 inches.

The A horizon has hue of 2.5Y or 10YR, value of 4 or 5 (3 moist), and chroma of 1 or 2. It ranges from neutral to moderately alkaline. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6 (3 or 4 moist), and chroma of 1 to 3. It ranges from mildly alkaline to strongly alkaline.

Carter Series

The Carter series consists of deep, moderately well drained soils formed in clayey material on uplands and terraces. Permeability is very slow. Slopes range from 0 to 3 percent.

These soils are taxadjuncts to the Carter series because they are not characterized by an abrupt textural change between the A and B horizons. Also, they contain less clay in the B horizon than is definitive for the Carter series.

Carter soils are similar to Hurley and Jerauld soils and commonly are near Opal and Promise soils. Hurley and Opal soils are 20 to 40 inches deep over shale. Opal soils are slightly higher on the landscape than the Carter soils. Jerauld soils formed in clay loam glacial till. Promise soils do not have an argillic horizon. They are in positions on the landscape similar to those of the Carter soils.

Typical pedon of Carter silt loam, 95 feet east and 2,140 feet south of the northwest corner of sec. 32, T. 108 N., R. 72 W.

A—0 to 4 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—4 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium columnar structure; very hard, very firm, sticky and plastic; common fine roots; mildly alkaline; clear wavy boundary.

Bt2—7 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, very firm, sticky and plastic; mildly alkaline; abrupt wavy boundary.

BC—11 to 18 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, very firm, sticky and plastic; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—18 to 25 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

Ckz—25 to 56 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine accumulations of carbonate and few fine accumulations of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

C—56 to 60 inches; light olive gray (5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 15 to 28 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to free carbonates ranges from 10 to 23 inches.

The A horizon has value of 4 or 5 (3 moist) and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 to 3.

Cavo Series

The Cavo series consists of deep, moderately well drained soils formed in loamy glacial till on uplands. Permeability is slow. Slopes range from 0 to 3 percent.

Cavo soils are similar to DeGrey and Farmsworth soils and commonly are near Eakin, Jerauld, Millboro, Promise, and Ree soils. DeGrey soils contain less sand in the argillic horizon than the Cavo soils. The well drained Eakin, Millboro, Promise, and Ree soils do not have a natric horizon. They are higher on the landscape than the Cavo soils. Farmsworth soils are dark to a depth of more than 20 inches. Jerauld soils have visible salts within a depth of 16 inches. They are in small pits and depressions.

Typical pedon of Cavo silt loam, in an area of Cavo-Jerauld silt loams, 120 feet west and 900 feet north of the southeast corner of sec. 28, T. 107 N., R. 69 W.

A—0 to 4 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; many very fine and few fine roots; neutral; clear smooth boundary.

E—4 to 8 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak and moderate thin platy structure; soft, very friable; common very fine and few fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 10 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine and few fine roots; mildly alkaline; clear smooth boundary.

Bt2—10 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; moderately alkaline; gradual smooth boundary.

Bt3—14 to 19 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; moderately alkaline; gradual smooth boundary.

BCkz—19 to 27 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; few fine accumulations of carbonate; few fine nests of salts; few very fine roots; strong effervescence; moderately alkaline; gradual smooth boundary.

Ckz—27 to 41 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; common fine accumulations of carbonate; common fine nests of salts; few very fine roots; strong effervescence; moderately alkaline; gradual smooth boundary.

C—41 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct yellowish brown (10YR 5/6) and very dark brown (10YR 2/2) mottles; massive; very hard, friable, sticky and plastic; common fine and medium accumulations of carbonate; few fine nests of salts; few very fine roots; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 38 inches. The depth to free carbonates ranges from 10 to

20 inches. The mollic epipedon is less than 20 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The E horizon has value of 5 to 7 (3 or 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is moderately alkaline or strongly alkaline.

Chantier Series

The Chantier series consists of shallow, well drained soils formed in clayey shale residuum on uplands. Permeability is very slow. Slopes range from 2 to 15 percent.

Chantier soils commonly are near Bullcreek, Opal, and Sansarc soils. Bullcreek soils do not have shale within a depth of 40 inches. They are on fans and along drainageways. Opal soils contain less salts than the Chantier soils and are 20 to 40 inches deep to shale. They are in positions on the landscape similar to those of the Chantier soils. Sansarc soils contain less salts than the Chantier soils and are not so firm. They are on the steeper parts of the landscape.

Typical pedon of Chantier clay, in an area of Chantier-Sansarc clays, 2 to 15 percent slopes, 135 feet west and 1,060 feet north of the southeast corner of sec. 11, T. 105 N., R. 71 W.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Bw—3 to 8 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse and medium subangular blocky structure; extremely hard, extremely firm, sticky and plastic; few very fine roots; strong effervescence; mildly alkaline; clear wavy boundary.

Ckz—8 to 17 inches; grayish brown (2.5Y 5/2) shaly clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, extremely firm, sticky and plastic; few very fine roots; common fine accumulations of gypsum and other salts; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cr—17 to 60 inches; light brownish gray (2.5Y 6/2) shale, dark grayish brown (2.5Y 4/2) moist; common fine accumulations of gypsum and other salts, carbonate in seams, strong effervescence; mildly alkaline.

The depth to shale ranges from 10 to 20 inches. The depth to free carbonates ranges from 0 to 8 inches. The dark soil colors are mostly inherited from the shale. The control section averages as low as 60 percent clay in some pedons and as high as 70 percent clay in others.

The A horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. The Bw horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 or 2. It is moderately alkaline or strongly alkaline.

DeGrey Series

The DeGrey series consists of deep, moderately well drained soils formed in silty material over clay loam glacial till. These soils are on uplands. Permeability is slow. Slopes range from 0 to 3 percent.

DeGrey soils are similar to Cavo and Farmsworth soils and commonly are near Beadle, Eakin, Highmore, Java, and Jerauld soils. Beadle, Eakin, Highmore, and Java soils do not have a natric horizon. They are slightly higher on the landscape than the DeGrey soils. Cavo soils contain more sand in the argillic horizon than the DeGrey soils. Farmsworth soils are dark to a depth of more than 20 inches. Jerauld soils have visible salts within a depth of 16 inches. They are in small pits and depressions.

Typical pedon of DeGrey silt loam, in an area of Eakin-DeGrey silt loams, 0 to 3 percent slopes, 40 feet west and 1,060 feet north of the southeast corner of sec. 36, T. 103 N., R. 67 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure parting to weak fine granular; soft, very friable; common very fine roots; neutral; clear smooth boundary.

E—6 to 10 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak very thick platy structure parting to weak fine subangular blocky; soft, very friable, common very fine roots, neutral; abrupt wavy boundary.

Bt1—10 to 12 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist, moderate medium columnar structure; very hard, very firm, sticky and plastic; common fine roots; moderately alkaline; abrupt wavy boundary.

Bt2—12 to 20 inches, dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist, moderate medium prismatic structure parting to moderate medium subangular blocky, very hard, very firm, sticky and plastic, shiny surfaces on peds; common very fine roots, moderately alkaline, clear wavy boundary.

BCk—20 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; common fine roots; common medium accumulations of carbonate; few fine accumulations of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Ckz1—25 to 33 inches; pale brown (10YR 6/3) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; common fine accumulations of carbonate; common fine and medium accumulations of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Ckz2—33 to 48 inches; pale brown (10YR 6/3) silty clay loam, light olive brown (2.5Y 5/4) moist; many fine and medium faint light brownish gray (10YR 6/2) and few fine distinct brownish yellow (10YR 6/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; common fine accumulations of carbonate; common fine and medium accumulations of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

2C—48 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct light gray (10YR 7/2) and few fine prominent red (2.5YR 4/8) mottles; massive; hard, firm, sticky and plastic; few very fine roots; few fine dark concretions of iron and manganese oxide; few fine accumulations of salts and gypsum; few fine fragments of shale; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 23 to 31 inches. The depth to free carbonates ranges from 15 to 22 inches. The thickness of the mollic epipedon ranges from 15 to 20 inches. The sodium absorption ratio and percentage of exchangable sodium are 10 to 20 in the natric horizon. The thickness of the silty material over the loamy glacial till ranges from 30 to 50 inches. The content of fine sand or coarser sand in the silty material is less than 15 percent.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 moist), and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. It ranges from neutral to moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. The 2C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4.

Delmont Series

The Delmont series consists of somewhat excessively drained soils that are shallow over gravelly sand. These soils formed in loamy alluvium over gravelly sand. They are on outwash plains and terraces. Permeability is moderate in the solum and rapid in the underlying material. Slopes range from 2 to 15 percent.

Delmont soils are similar to Oahe, Orton, and Schamber soils and commonly are near Oahe, Ree, and Schamber soils. Oahe and Orton soils are 20 to 40 inches deep over gravelly material. Ree soils do not have gravelly material within a depth of 40 inches. They are slightly lower on the landscape than the Delmont soils. Schamber soils have gravelly material within a depth of 10 inches.

Typical pedon of Delmont loam, in an area of Oahe-Delmont loams, 2 to 6 percent slopes, 1,050 feet south and 150 feet west of the northeast corner of sec. 16, T. 107 N., R. 68 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; many fine and very fine roots; neutral; clear smooth boundary.

Bw1—4 to 8 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, friable; many very fine roots; few fine accumulations of carbonate; few small pebbles; strong effervescence; mildly alkaline; clear wavy boundary.

Bw2—8 to 16 inches; dark gray (10YR 4/1) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, friable; common very fine roots; few fine accumulations of carbonate; few small pebbles; strong effervescence; mildly alkaline; clear wavy boundary.

2Ck—16 to 28 inches; multicolored gravelly sand; single grain; loose; few very fine roots; few fine accumulations of carbonate; coatings of carbonate on gravel; strong effervescence; moderately alkaline; diffuse wavy boundary.

2C—28 to 60 inches; multicolored gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum ranges from 14 to 20 inches in thickness. It is neutral or mildly alkaline throughout. The depth to free carbonates ranges from 0 to 10 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 or 3. The Bw horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. Some pedons have a Bk horizon. The 2C horizon is mildly alkaline or moderately alkaline. The sand is medium or coarse, and

the gravel content ranges from 20 to more than 50 percent

Dorna Series

The Dorna series consists of deep, well drained soils formed in silty material over clayey sediments. These soils are on uplands. Permeability is moderate in the silty material and slow in the underlying silty clay. Slopes range from 0 to 3 percent.

Dorna soils are similar to Lowry and McClure soils and commonly are near Lowry and Millboro soils. Lowry soils do not have clayey material within a depth of 40 inches. The silty mantle in the McClure soils contains slightly more clay than that in the Dorna soils. Millboro soils are clayey throughout. They are in positions on the landscape similar to those of the Dorna soils.

Typical pedon of Dorna silt loam, 65 feet north and 1,630 feet west of the southeast corner of sec. 10, T. 105 N., R. 71 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary.

A1—5 to 10 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; neutral; clear wavy boundary.

A2—10 to 17 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—17 to 23 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—23 to 27 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

2Ck—27 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C'1—34 to 48 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fragments of shale; few fine roots; common medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C'2—48 to 55 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C'3—55 to 60 inches; olive (5Y 5/3) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine accumulations of salts; strong effervescence; moderately alkaline.

The depth to the clayey material ranges from 20 to 40 inches. Free carbonates are within a depth of 10 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. It is neutral or mildly alkaline. The C horizon has value of 5 (4 moist) and chroma of 2 or 3. The 2C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is silty clay, clay, or silty clay loam that has a clay content of more than 35 percent. The C and 2C horizons are mildly alkaline or moderately alkaline.

Durrstein Series

The Durrstein series consists of deep, poorly drained soils formed in clayey alluvium on flood plains. Permeability is slow. Slopes are less than 1 percent.

Durrstein soils commonly are near Egas soils. The nearby Egas soils do not have a natric horizon and are shallower to visible salts than the Durrstein soils. They are in positions on the landscape similar to those of the Durrstein soils.

Typical pedon of Durrstein silt loam, 2,430 feet west and 75 feet north of the southeast corner of sec. 23, T. 104 N., R. 70 W.

E—0 to 1 inch; gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; slightly hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

Bt1—1 to 4 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; gray (10YR 6/1) coatings on the tops of columns; weak medium and coarse columnar structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; few fine flat roots; mildly alkaline; clear smooth boundary.

Bt2—4 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, very firm, sticky and plastic; few fine flat roots; strongly alkaline; clear wavy boundary.

BCkz—7 to 19 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium and coarse

subangular blocky; very hard, very firm, sticky and plastic; few fine roots; common fine nests of salts; few fine accumulations of carbonate; strong effervescence; strongly alkaline; clear wavy boundary.

Ckzg—19 to 40 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; very hard, firm, sticky and plastic; few fine roots; common fine nests of salts; few fine accumulations of carbonate; strong effervescence; very strongly alkaline; gradual wavy boundary.

Cg—40 to 60 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; very hard, firm, sticky and plastic; few fine roots; common fine nests of salts; common coarse nests of gypsum; few fine accumulations of carbonate; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 10 to 25 inches. The depth to accumulations of salts ranges from 5 to 15 inches.

The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay or silty clay. It ranges from neutral to strongly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (3 or 4 moist), and chroma of 1 or 2. It is silty clay, clay loam, or silty clay loam. It ranges from moderately alkaline to very strongly alkaline. Some pedons have few to many, fine or medium, faint to prominent mottles in the BC and C horizons.

Eakin Series

The Eakin series consists of deep, well drained soils formed in silty material over clay loam glacial till. These soils are on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 3 percent.

Eakin soils are similar to Glenham and Highmore soils and commonly are near DeGrey, Highmore, Jerauld, and Mobridge soils. DeGrey and Jerauld soils have a natric horizon. They are in small pits and depressions. Glenham soils contain more sand and less silt in the subsoil than the Eakin soils. Highmore soils have glacial till below a depth of 40 inches. The moderately well drained Mobridge soils are in swales.

Typical pedon of Eakin silt loam, in an area of Eakin-DeGrey silt loams, 0 to 3 percent slopes, 80 feet west and 400 feet north of the southeast corner of sec. 23, T. 102 N., R. 67 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable; neutral; clear smooth boundary.

Bt1—7 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; neutral; clear smooth boundary.

Bt2—13 to 18 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; neutral; clear smooth boundary.

BCk—18 to 36 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; few fine faint yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual irregular boundary.

2Ck—36 to 46 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish red (5YR 5/8) and brown (7.5YR 5/2) mottles; massive; very hard, firm, sticky and plastic; common fine to coarse accumulations of carbonate; strong effervescence; strongly alkaline; clear wavy boundary.

2C—46 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium prominent yellowish red (5YR 5/8), light brownish gray (2.5Y 6/2), and brown (7.5YR 5/2) mottles; massive; very hard, firm, sticky and plastic; few fine accumulations of carbonate; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 20 to 38 inches. The thickness of the mollic epipedon ranges from 9 to 20 inches. The depth to free carbonates ranges from 10 to 18 inches. The depth to loam or clay loam glacial till ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. The 2C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is loam or clay loam glacial till. It ranges from mildly alkaline to strongly alkaline.

Egas Series

The Egas series consists of deep, poorly drained soils formed in alluvium on flood plains. Permeability is slow. Slopes are less than 1 percent.

Egas soils commonly are near Betts, Durrstein, Egas Variant, and Java soils. The well drained Betts and Java soils are on uplands. Durrstein and Egas Variant soils are in positions on the landscape similar to those of the Egas soils. Durrstein soils have a natric horizon. Egas Variant soils have a calcic horizon.

Typical pedon of Egas silty clay loam, 1,690 feet east and 505 feet north of the southwest corner of sec. 24, T. 107 N., R. 68 W.

A1—0 to 1 inch; gray (10YR 5/1) silty clay loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, firm, slightly sticky and slightly plastic; common fine roots; mildly alkaline; abrupt smooth boundary.

A2—1 to 5 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine accumulations of salts and gypsum; common fine roots; moderately alkaline; clear wavy boundary.

ACzg—5 to 13 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; many fine and medium accumulations of salts; common fine roots; strong effervescence; strongly alkaline; gradual wavy boundary.

Czg1—13 to 20 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; massive; very hard, very firm, sticky and plastic; common fine and medium accumulations of gypsum and other salts; few fine roots; strong effervescence; strongly alkaline; gradual wavy boundary.

Czg2—20 to 33 inches; gray (5Y 6/1) silty clay, olive gray (5Y 4/2) moist; massive; very hard, very firm, slightly sticky and plastic; few fine roots; common fine and medium accumulations of gypsum and other salts; strong effervescence; strongly alkaline; gradual wavy boundary.

Cg1—33 to 58 inches; gray (5Y 6/1) clay loam, olive gray (5Y 4/2) moist; common fine faint light olive brown (2.5Y 5/6) mottles; massive; very hard, firm, slightly sticky and plastic; few fine roots; common fine accumulations of gypsum and other salts; strong effervescence; strongly alkaline; gradual wavy boundary.

Cg2—58 to 60 inches; light gray (5Y 7/1) silty clay, dark gray (5Y 4/1) moist; common fine faint light olive brown (2.5Y 5/6) mottles; massive; very hard, very firm, sticky and plastic; common fine accumulations of gypsum and other salts; strong effervescence; moderately alkaline.

The thickness of the mollic epipedon ranges from 8 to 24 inches. The depth to accumulations of salts ranges from 0 to 7 inches. Carbonates are within a depth of 10 inches.

The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The AC horizon has value of 4 or 5 (2 to 4 moist) and chroma of 1 or 2. It is silty clay loam or silty clay. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 1 or 2. It is stratified silty clay, silty clay loam, and clay loam.

Egas Variant

The Egas Variant consists of deep, very poorly drained soils formed in alluvium on flood plains. Permeability is slow. Slopes are less than 1 percent.

Egas Variant soils commonly are near Durrstein, Egas, and Schamber soils. Durrstein and Egas soils are slightly higher on the flood plains than the Egas Variant soils. Durrstein soils have a natric horizon. Egas soils do not have a calcic horizon. Schamber soils have gravelly material within a depth of 10 inches. They are on ridges and terrace scarps.

Typical pedon of Egas Variant silty clay loam, 60 feet north and 1,800 feet west of the southeast corner of sec. 4, T. 107 N., R. 68 W.

A1—0 to 4 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common fine roots; mildly alkaline; clear wavy boundary.

A2—4 to 10 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

ACk—10 to 20 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine roots; many fine and few medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

Ckg1—20 to 50 inches; gray (5Y 6/1) silty clay loam, olive gray (5Y 4/2) moist; massive; slightly hard, friable, sticky and slightly plastic; few fine roots; few fine accumulations of salts; common fine to coarse accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

Ckg2—50 to 60 inches; gray (5Y 6/1) silty clay loam, olive gray (5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few fine roots; few fine accumulations of salts; few fine black (10YR 2/1) concretions of iron and manganese oxide; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 10 to 25 inches. Free carbonates are within a depth of 5 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is mildly alkaline or moderately alkaline. The ACk horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. It is silty clay loam or silty clay. The C

horizon has hue of 10YR to 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. It is silty clay, silty clay loam, or clay loam. Thin strata of coarser textured material are between depths of 40 and 60 inches in some pedons.

Farmsworth Series

The Farmsworth series consists of deep, somewhat poorly drained soils formed in clayey and silty glaciolacustrine sediments on flood plains. Permeability is slow or very slow. Slopes are 0 to 2 percent.

Farmsworth soils are similar to Cavo and DeGrey soils and commonly are near Bon, Durrstein, Egas, and Lane soils. The moderately well drained Bon and Lane soils do not have a natric horizon. They are slightly higher on the flood plains than the Farmsworth soils. Cavo and DeGrey soils are dark to a depth of less than 20 inches. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains.

Typical pedon of Farmsworth silt loam, in [redacted] of Lane-Farmsworth silt loams, 350 feet east and 2,560 feet south of the northwest corner of sec. 4, T. 104 N., R. 67 W.

A—0 to 5 inches, gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; soft, very friable; many very fine roots; slightly acid; clear smooth boundary.

E—5 to 8 inches, light gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; moderate thin platy structure; soft, very friable; common very fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 10 inches, dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium and coarse columnar structure; hard, very firm, very sticky and very plastic; few very fine roots; light gray (10YR 6/1) coatings on the tops and sides of columns; neutral; clear smooth boundary.

Bt2—10 to 18 inches, dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; light gray (10YR 6/1) coatings on the sides of prisms; mildly alkaline; clear wavy boundary.

Bt3—18 to 26 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; few light gray (10YR 6/1) coatings on the sides of prisms; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; very few fine accumulations of carbonate; few fine and medium accumulations of salts; mildly alkaline; clear wavy boundary.

BCkz—26 to 39 inches; dark grayish brown (10YR 4/2) silty clay, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; common medium and coarse accumulations of carbonate; many fine and medium accumulations of salts; strong effervescence; mildly alkaline; gradual wavy boundary.

Ck—39 to 46 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; common fine distinct brownish yellow (10YR 6/6) mottles; massive; hard, firm, sticky and plastic; few very fine roots; many fine and medium accumulations of carbonate; few fine accumulations of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Cg—46 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct light gray (N 7/0) and many fine and medium distinct brownish yellow (10YR 6/6) mottles; massive; hard, friable, slightly sticky; common fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum and of the mollic epipedon ranges from 20 to 40 inches. The depth to free carbonates ranges from 10 to 30 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. The Bt horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1. It averages as low as 45 percent clay in some pedons and as high as 60 percent clay in others. It ranges from neutral to mildly alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (3 to 5 moist), and chroma of 1 or 2.

Gettys Series

The Gettys series consists of deep, well drained soils formed in firm, loamy and clayey glacial till on uplands. Permeability is moderately slow. Slopes range from 9 to 40 percent.

Gettys soils are similar to Betts soils and commonly are near Betts, Sansarc, Schamber, and Sully soils. Betts soils contain less clay throughout than the Gettys soils. Sansarc soils are 4 to 20 inches deep over shale. They are slightly lower on the landscape than the Gettys soils. Schamber and Sully soils are in positions on the landscape similar to those of the Gettys soils. Schamber soils are underlain by gravelly material within a depth of 10 inches. The silty Sully soils formed in loess.

Typical pedon of Gettys clay loam, 25 to 40 percent slopes, 100 feet east and 530 feet south of the northwest corner of sec. 8, T. 103 N., R. 71 W.

A—0 to 2 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) and dark grayish

brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few pebbles; strong effervescence; moderately alkaline; clear smooth boundary.

AC—2 to 8 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few pebbles; few fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—8 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few pebbles; common medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—24 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct olive yellow (2.5Y 6/8) mottles; hard, firm, sticky and plastic; few fine roots; few pebbles; few fragments of shale; few fine accumulations of carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—30 to 39 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct olive yellow (2.5Y 6/8) mottles; massive; hard, firm, sticky and plastic; few pebbles; few fragments of shale; few fine accumulations of carbonate and salts; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—39 to 50 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; common fine to coarse distinct light yellowish brown (2.5Y 6/4) and dark brown (10YR 4/3) mottles; massive; hard, firm, sticky and plastic; few pebbles; about 20 percent fragments of shale; common fine accumulations of salts; few fine accumulations of carbonate; slight effervescence; moderately alkaline; diffuse wavy boundary.

C4—50 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine to coarse faint light yellowish brown (2.5Y 6/4) and distinct dark brown (10YR 4/3) mottles; massive; hard, firm, sticky and plastic; common fine accumulations of salts; few pebbles; few fragments of shale; slight effervescence; moderately alkaline.

Free carbonates are at the surface or within a few inches of it. The control section averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. Few or common pebbles and cobbles are throughout the profile in most pedons.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 or 2. It is neutral to moderately alkaline. It dominantly is clay loam but in some pedons is loam or silt loam. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It is clay loam or clay. The content of shale fragments in this horizon ranges from 5 to 25 percent.

Glenham Series

The Glenham series consists of deep, well drained soils formed in loamy glacial till on uplands. Permeability is moderate in the subsoil and moderately slow in the underlying material. Slopes range from 0 to 9 percent.

Glenham soils are similar to Eakin and Ree soils and commonly are near Highmore, Java, Mobridge, and Plankinton soils. Eakin and Highmore soils contain less sand in the subsoil than the Glenham soils. They are in positions on the landscape similar to those of the Glenham soils. Java soils have free carbonates within a depth of 10 inches. They are on convex slopes, knolls, and ridges. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions. The underlying material in the Ree soils is stratified.

Typical pedon of Glenham loam, in an area of Glenham-Java loams, 3 to 6 percent slopes, 245 feet west and 745 feet north of the southeast corner of sec. 19, T. 108 N., R. 69 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; many fine roots; neutral; clear smooth boundary.

Bt1—4 to 7 inches; dark grayish brown (10YR 4/2) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear smooth boundary.

Bt2—7 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; shiny surfaces on peds; neutral; clear wavy boundary.

BCk—11 to 16 inches; light brownish gray (10YR 6/2) clay loam, dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Ck—16 to 28 inches, light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and medium accumulations of carbonate; mildly alkaline; diffuse wavy boundary.

C—28 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine strong brown (7.5YR 5/6) accumulations of iron and manganese oxide; few fine accumulations of carbonate; moderately alkaline.

The thickness of the solum ranges from 14 to 28 inches. The depth to free carbonates ranges from 10 to 14 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It dominantly is loam but in some pedons is silt loam. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It averages as low as 25 percent clay in some pedons and as high as 35 percent clay in others. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4.

Highmore Series

The Highmore series consists of deep, well drained soils formed in silty material on uplands. Permeability is moderate. Slopes range from 0 to 9 percent.

Highmore soils are similar to Eakin and Lily soils and commonly are near DeGrey, Eakin, Java, Mobridge, and Plankinton soils. DeGrey soils have a natric horizon. They are in small depressions. Eakin soils are 20 to 40 inches deep over loamy glacial till. Java soils contain more sand than the Highmore soils and are not so deep to free carbonates. They are on ridges and knolls. The moderately well drained Mobridge soils are in swales. The poorly drained Plankinton soils are in depressions. Lily soils do not have an argillic horizon.

Typical pedon of Highmore silt loam, in an area of Highmore-Mobridge silt loams, 0 to 4 percent slopes, 140 feet north and 1,585 feet west of the southeast corner of sec. 2, T. 103 N., R. 69 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary.

Bt1—6 to 17 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny surfaces on peds; mildly alkaline; clear wavy boundary.

Bt2—17 to 21 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; shiny surfaces on peds; mildly alkaline; abrupt wavy boundary.

BCk—21 to 26 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck1—26 to 38 inches; pale yellow (2.5Y 7/4) silt loam, olive brown (2.5Y 4/4) moist; few fine faint brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable; common medium and coarse accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Ck2—38 to 46 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2) moist; many fine and medium distinct yellowish brown (10YR 5/8) and light gray (10YR 7/1) mottles; massive; soft, very friable; common medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C—46 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many fine to coarse prominent strong brown (7.5YR 5/8) mottles; massive; soft, very friable; few fine and medium accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 38 inches. The thickness of the mollic epipedon ranges from 9 to 20 inches. The depth to free carbonates ranges from 12 to 24 inches.

The Ap horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It averages as low as 27 percent clay in some pedons and as high as 35 percent clay in others. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. It is silty clay loam, silt loam, or very fine sandy loam.

Hurley Series

The Hurley series consists of moderately deep, well drained soils that formed in clayey shale residuum on uplands. Permeability is very slow. Slopes range from 0 to 6 percent.

Hurley soils are similar to Carter and Jerauld soils and commonly are near Bullcreek, Opal, Promise, and Sansarc soils. Bullcreek and Promise soils are in positions on the landscape similar to those of the Hurley

soils. They do not have a natric horizon. Carter and Jerauld soils do not have shale within a depth of 40 inches. Opal soils and the shallow Sansarc soils do not have a natric horizon. They are higher on the landscape than the Hurley soils.

Typical pedon of Hurley silt loam, 0 to 6 percent slopes, 310 feet west and 2,380 feet south of the northeast corner of sec. 20, T. 106 N., R. 69 W.

E—0 to 2 inches; light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—2 to 4 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse columnar structure; very hard, very firm, sticky and plastic; few fine flat roots; moderately alkaline; abrupt smooth boundary.

Bt2—4 to 8 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and plastic; few fine flat roots; moderately alkaline; abrupt wavy boundary.

BCkz—8 to 14 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and plastic; few fine flat roots; common fine accumulations of salts and carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Ckz—14 to 21 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) moist; massive; very hard, very firm, sticky and plastic; few fine flat roots; common fine accumulations of salts; common fine and medium accumulations of carbonate and gypsum; strong effervescence; moderately alkaline; gradual wavy boundary.

Cz—21 to 30 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) shaly clay, grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; few fine stains, yellowish brown (10YR 5/6) moist; common fine accumulations of salts; few fine accumulations of carbonate; many fine and medium accumulations of gypsum; strong effervescence; moderately alkaline; gradual wavy boundary.

Cr—30 to 60 inches; light gray (2.5Y 7/2) and olive yellow (2.5Y 6/6) shale, grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) moist; common fine and medium nests of gypsum and other salts; strong effervescence; moderately alkaline.

The depth to free carbonates ranges from 4 to 12 inches. The depth to shale ranges from 20 to 40 inches.

The E horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It averages as low as 60 percent clay in some pedons and as high as 70 percent clay in others. It is mildly alkaline or moderately alkaline. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 or 2. It ranges from mildly alkaline to strongly alkaline. The Cr horizon ranges from slightly acid to moderately alkaline.

Java Series

The Java series consists of deep, well drained soils formed in loamy glacial till on uplands. Permeability is moderate in the upper part of the profile and moderately slow in the lower part. Slopes range from 2 to 25 percent.

Java soils are similar to Betts soils and commonly are near Betts, Glenham, Highmore, and Mobridge soils. Betts soils do not have a mollic epipedon. Glenham and Highmore soils have an argillic horizon. They are on the less sloping parts of the landscape. The moderately well drained Mobridge soils are in swales.

Typical pedon of Java loam, in an area of Java-Betts loams, 9 to 20 percent slopes, 310 feet west and 330 feet south of the northeast corner of sec. 28, T. 108 N., R. 68 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; common very fine roots; slight effervescence; neutral; clear wavy boundary.

Bw—4 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common very fine roots; strong effervescence; mildly alkaline; gradual wavy boundary.

BCk—8 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; common very fine roots; common medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck1—18 to 24 inches; pale brown (10YR 6/3) loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common medium accumulations of carbonate and salts; strong effervescence; moderately alkaline; diffuse wavy boundary.

Ck2—24 to 35 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; few fine distinct

strong brown (7.5YR 5/8) and light gray (N 7/0) mottles; massive; hard, friable; slightly sticky and slightly plastic; few very fine roots; few medium and coarse accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—35 to 45 inches; light yellowish brown (2.5Y 6/4) loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct light gray (N 7/0), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/6) mottles; massive; hard, friable; slightly sticky and slightly plastic; few very fine roots; few fragments of shale; few fine accumulations of carbonate; strong effervescence; moderately alkaline; diffuse wavy boundary.

C2—45 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine distinct reddish yellow (7.5YR 6/6) and dark reddish gray (5YR 4/2) stains; strong effervescence; moderately alkaline.

The depth to free carbonates is less than 10 inches. The thickness of the solum ranges from 15 to 20 inches. The control section averages as low as 18 percent clay in some pedons and as high as 30 percent clay in others.

The A horizon has value of 4 (2 or 3 moist) and chroma of 2. The Bw horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is loam or clay loam. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is clay loam or loam.

Jerauld Series

The Jerauld series consists of deep, somewhat poorly drained soils formed in loamy glacial till on uplands. Permeability is slow. Slopes range from 0 to 5 percent.

Jerauld soils are similar to Carter and Hurley soils and commonly are near Beadle, DeGrey, Eakin, and Highmore soils. Beadle, Eakin, and Highmore soils do not have a natric horizon. They are on the high parts of the landscape. Carter and Hurley soils contain more clay in the subsoil than the Jerauld soils. DeGrey soils are deeper to visible salts than the Jerauld soils. Also, they are slightly higher on the landscape.

Typical pedon of Jerauld silt loam, in an area of Beadle-Jerauld complex, 1 to 5 percent slopes, 180 feet south and 740 feet east of the northwest corner of sec. 17, T. 108 N., R. 69 W.

E—0 to 2 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure; soft, friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—2 to 4 inches; dark grayish brown (10YR 4/2) clay loam, black (10YR 2/1) moist; moderate medium columnar structure parting to strong fine blocky; very hard, very firm, sticky and plastic; few very fine flat roots; thin continuous gray (10YR 6/1) coatings on the tops of columns; neutral; clear wavy boundary.

Bt2—4 to 9 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong fine and medium blocky; very hard, firm, sticky and plastic; few very fine flat roots; mildly alkaline; clear wavy boundary.

BCkz—9 to 14 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, sticky and plastic; few very fine flat roots; few fine and medium nests of gypsum and salts; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Ckz1—14 to 29 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common medium and fine nests of gypsum and salts; common medium accumulations of carbonate; violent effervescence; mildly alkaline; gradual wavy boundary.

Ckz2—29 to 40 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent strong brown (7.5YR 5/8) mottles; common fine and medium prominent very dark brown (10YR 2/2) manganese stains; massive; hard, firm, slightly sticky and slightly plastic; common medium nests of gypsum and salts; common medium accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine faint light olive brown (2.5Y 5/4) and few fine prominent yellowish red (5YR 4/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 10 to 20 inches. The depth to free carbonates ranges from 6 to 12 inches. Some pedons have an A horizon, which is 1 to 2 inches thick.

The E horizon has value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It ranges from medium acid to neutral. The Bt horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay loam, clay, or silty clay. It ranges from neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 to 4. It is silty clay loam, clay loam, silty clay, or clay. It ranges from mildly alkaline to strongly alkaline.

Kolls Series

The Kolls series consists of deep, poorly drained soils formed in clayey sediments in depressions in the uplands. Permeability is very slow. Slopes are less than 1 percent.

Kolls soils are similar to Plankinton and Worthing soils and commonly are near Promise soils. Plankinton soils contain less clay in the subsoil than the Kolls soils. The well drained Promise soils are higher on the landscape than the Kolls soils. Worthing soils are more than 35 inches deep to free carbonates.

Typical pedon of Kolls silty clay, 55 feet west and 1,400 feet south of the northeast corner of sec. 28, T. 106 N., R. 69 W.

A—0 to 2 inches, gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, firm, sticky and plastic; common fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

Bw—2 to 10 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; few fine reddish yellow (7.5YR 6/8) mottles; moderate coarse prismatic structure parting to weak coarse and medium blocky; extremely hard, very firm, sticky and plastic; common fine roots; common pressure faces; strong effervescence; moderately alkaline; gradual irregular boundary.

Bg—10 to 17 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) crushing to dark gray (5Y 4/1) moist; few fine reddish yellow (7.5YR 6/8) mottles; moderate medium and coarse prismatic structure parting to moderate medium and coarse blocky; extremely hard, very firm, sticky and plastic; common fine roots; common gray (10YR 5/1) tongues; common pressure faces; strong effervescence; moderately alkaline; gradual wavy boundary.

BCg—17 to 26 inches, gray (5Y 5/1) clay, very dark gray (5Y 3/1) crushing to dark gray (5Y 4/1) moist; few fine reddish yellow (7.5YR 6/8) mottles; weak medium and coarse prismatic structure parting to weak medium and coarse blocky; extremely hard, very firm, sticky and plastic, common fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

Cg1—26 to 54 inches, gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; common fine to coarse reddish yellow (7.5YR 6/8) mottles; massive; extremely hard, very firm, sticky and plastic, few fine roots; few medium accumulations of carbonate; strong effervescence, moderately alkaline; diffuse wavy boundary.

Cg2—54 to 60 inches; gray (5Y 6/1) clay, olive gray (5Y 4/2) moist; common fine and few medium prominent reddish yellow (7.5YR 6/8) mottles; massive; extremely hard, very firm, sticky and plastic; few fine roots; few fine nests of gypsum; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 18 to 40 inches. The mollic epipedon is less than 30 inches thick. Free carbonates are at the surface or within a few inches of it. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 or 5 (2 or 3 moist) and chroma of 0 or 1. The B horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 4 or 5 (2 to 4 moist) and chroma of 0 or 1. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3. In some pedons the chroma is 3 below a depth of 40 inches.

Lane Series

The Lane series consists of deep, moderately well drained soils formed in clayey and silty sediments on flood plains and low terraces. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Lane soils are similar to Mobridge soils and commonly are near Bon, Durrstein, Egas, and Farmsworth soils. Bon soils contain less clay throughout than the Lane soils. They are in positions on the landscape similar to those of the Lane soils. The poorly drained Durrstein and Egas soils are on the lower parts of the flood plains. Farmsworth soils have a natric horizon. They are in small depressions. Mobridge soils contain less clay in the subsoil than the Lane soils.

Typical pedon of Lane silty clay loam, 135 feet south and 1,320 feet east of the northwest corner of sec. 23, T. 105 N., R. 68 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, very friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

A—5 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist, weak medium subangular blocky structure parting to weak medium platy and weak medium granular; hard, friable, slightly sticky and slightly plastic; slightly acid, clear smooth boundary.

Bt1—8 to 13 inches, dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; shiny surfaces on peds, neutral, clear smooth boundary.

Bt2—13 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist, weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; shiny surfaces on peds, mildly alkaline; clear wavy boundary.

Bt3—19 to 25 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; shiny surfaces on peds; few fine accumulations of carbonate; slight effervescence; moderately alkaline; clear smooth boundary.

BCk—25 to 33 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/8) mottles; weak medium and fine subangular blocky structure; hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

Ck—33 to 41 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; common fine faint yellowish brown (10YR 5/8) mottles; massive; hard, firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

C1—41 to 50 inches; grayish brown (10YR 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and plastic; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

C2—50 to 60 inches; light brownish gray (10YR 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common medium nests of gypsum; common fine to coarse accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 26 to 54 inches. The thickness of the mollic epipedon ranges from 25 to 36 inches. The depth to free carbonates ranges from 17 to 22 inches.

The A horizon has hue of 10YR, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others. It is neutral or mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Lowry Series

The Lowry series consists of deep, well drained soils formed in loess on uplands. Permeability is moderate. Slopes range from 0 to 15 percent.

Lowry soils are similar to Dorna, Lowry Variant, and Uly soils and commonly are near Dorna, Sully, and Uly soils. Dorna soils are 20 to 40 inches deep over clayey sediments. Lowry Variant soils are 22 to 40 inches deep over sandy material. Sully soils do not have a mollic epipedon. They are on the steeper parts of the landscape. Uly soils contain more clay throughout than the Lowry soils.

Typical pedon of Lowry silt loam, 0 to 2 percent slopes, 135 feet north and 1,000 feet east of the southwest corner of sec. 34, T. 103 N., R. 72 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary.

Bw1—7 to 11 inches; grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; mildly alkaline; clear smooth boundary.

Bw2—11 to 15 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; few very fine accumulations of carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

BC—15 to 20 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; few very fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

Ck—20 to 34 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; massive; soft, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—34 to 58 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; few very fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

C2—58 to 60 inches; pale brown (10YR 6/3) loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 30 inches. The depth to free carbonates and the thickness of the mollic epipedon range from 8 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The Bw horizon has value of 5 (3 moist) and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. It is silt loam, very fine sandy loam, or loam. The Bw and C horizons are mildly alkaline or moderately alkaline.

Lowry Variant

The Lowry Variant consists of deep, well drained soils formed in loess over sandy material. These soils are on high terraces along the Missouri River. Permeability is moderate in the upper part of the profile and moderately rapid in the underlying material. Slopes range from 0 to 6 percent.

Lowry Variant soils are similar to Orton soils and commonly are near Lowry and Orton soils. Lowry soils have less sand in the underlying material than the Lowry Variant soils. The content of gravel in the underlying material of the Orton soils is 20 to 60 percent.

Typical pedon of Lowry Variant silt loam, 2 to 6 percent slopes, 190 feet north and 530 feet east of the southwest corner of sec. 8, T. 107 N., R. 72 W.

Ap—0 to 7 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary.

Bw—7 to 11 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; neutral; slightly hard, very friable; mildly alkaline; gradual wavy boundary.

BC—11 to 16 inches, brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; strong effervescence; moderately alkaline; clear wavy boundary.

Ck1—16 to 20 inches, pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, very friable; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

Ck2—20 to 26 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; common fine accumulations of carbonate; strong effervescence; moderately alkaline; clear smooth boundary.

C1—26 to 36 inches; light gray (2.5Y 7/2) loamy very fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

2C2—36 to 55 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose; strong effervescence; strongly alkaline; clear smooth boundary.

2C3—55 to 60 inches; light brownish gray (2.5Y 6/2) sand, grayish brown (2.5Y 5/2) moist; single grain; loose; strong effervescence; strongly alkaline.

The thickness of the solum ranges from 14 to 25 inches. The depth to free carbonates and the thickness of the mollic epipedon range from 7 to 20 inches. The depth to sandy material ranges from 22 to 38 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The Bw horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is mildly alkaline or moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. It is loam, very fine sandy loam, or loamy very fine sand. The Bw and C horizons are mildly alkaline or moderately alkaline. The 2C horizon has hue of 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2 or 3. It is moderately alkaline or strongly alkaline.

McClure Series

The McClure series consists of deep, well drained soils formed in silty material over clayey sediments. These soils are on uplands. Permeability is moderately slow in the upper part of the profile and slow in the underlying material. Slopes range from 2 to 11 percent.

These soils are taxadjuncts to the McClure series because they do not have an argillic horizon, which is definitive for the series. They also have carbonates closer to the surface than is definitive for the series.

McClure soils are similar to Dorna and Millboro soils and commonly are near Opal and Uly soils. Dorna soils contain less clay in the subsoil than the McClure soils. Millboro and Opal soils contain more clay in the subsoil than the McClure soils. Also, Opal soils are 20 to 40 inches deep over shale. Uly soils do not have clayey material within a depth of 40 inches. Opal and Uly soils are in positions on the landscape similar to those of the McClure soils.

Typical pedon of McClure silt loam, 2 to 6 percent slopes, 1,650 feet north and 460 feet east of the southwest corner of sec. 20, T. 108 N., R. 72 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; abundant fine roots; slightly acid; clear smooth boundary.

Bw—6 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; soft, friable; abundant fine roots; neutral; clear wavy boundary.

Bk—14 to 22 inches, dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; common fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

2BCk—22 to 29 inches, light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; common fine and medium accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

2Ck—29 to 38 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine roots; about 10 percent weathered fragments of shale; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

2C—38 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine roots; about 20 percent weathered fragments of shale; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 15 to 30 inches. The depth to free carbonates ranges from 8 to 16 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to contrasting clayey material ranges from 20 to 30 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The B horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The 2C horizon has hue of 2.5Y or 5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 to 4. It is silty clay or clay. It is mildly alkaline or moderately alkaline.

Millboro Series

The Millboro series consists of deep, well drained soils formed in clayey material on uplands. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is slow. Slopes range from 0 to 9 percent.

Millboro soils are similar to Opal and Promise soils and commonly are near Glenham, Highmore, Java, and Okaton soils. Glenham, Highmore, and Java soils contain less clay throughout than the Millboro soils. They are in positions on the landscape similar to those of the Millboro soils. Okaton soils are 8 to 20 inches deep over shale. They are on the high parts of the landscape. Opal and Promise soils do not have an argillic horizon. Also, Opal soils are 20 to 40 inches deep over shale.

Typical pedon of Millboro silty clay loam, 2 to 6 percent slopes, 185 feet south and 2,450 feet east of the northwest corner of sec. 19, T. 101 N., R. 69 W.

Ap—0 to 5 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and fine blocky structure parting to weak fine and very fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; thin granular surface mulch; neutral; abrupt smooth boundary.

Bt1—5 to 11 inches, dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; weak medium and fine blocky structure parting to weak fine and very fine subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; neutral; clear wavy boundary.

Bt2—11 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist, moderate coarse prismatic structure parting to moderate fine and very fine subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues; neutral; clear wavy boundary.

BCk1—16 to 26 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate fine and very fine subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues, strong effervescence; mildly alkaline; clear wavy boundary.

BCk2—26 to 36 inches, grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse blocky structure parting to weak fine and medium subangular blocky; extremely hard, very firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues; common pressure faces, common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

C—36 to 45 inches; light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; massive; very hard, firm, sticky and plastic, few dark grayish brown (10YR 4/2) tongues; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.

Cz—45 to 60 inches; light olive brown (2.5Y 5/4) silty clay, olive brown (2.5Y 4/4) moist; massive; very hard, firm, sticky and plastic; common fine accumulations of salts; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 18 to 42 inches. The depth to free carbonates ranges from 9 to 16 inches. The thickness of the mollic epipedon also ranges from 9 to 16 inches. Reaction is neutral or mildly alkaline in the A and Bt horizons and mildly alkaline or moderately alkaline in the C horizon.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 to 3. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4.

Mobridge Series

The Mobridge series consists of deep, moderately well drained soils formed in silty alluvium in swales in the uplands. Permeability is moderate. Slopes range from 0 to 3 percent.

Mobridge soils are similar to Lane soils and commonly are near Eakin, Glenham, Highmore, Plankinton, and Uly soils. The well drained Eakin, Glenham, Highmore, and Uly soils have a mollic epipedon that is less than 20 inches thick. They are higher on the landscape than the Mobridge soils. Lane soils contain more clay in the subsoil than the Mobridge soils. The poorly drained Plankinton soils are in depressions.

Typical pedon of Mobridge silt loam, in an area of Mobridge-Plankinton silt loams, 2,100 feet north and 730 feet west of the southeast corner of sec. 16, T. 103 N., R. 69 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, very friable; neutral; clear smooth boundary.

A—7 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; neutral; clear smooth boundary.

Bt1—14 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

Bt2—19 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; neutral; clear smooth boundary.

Bt3—26 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

BCk—33 to 37 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; gradual wavy boundary.

C—37 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, slightly sticky and slightly plastic; moderately alkaline; strong effervescence; few fine accumulations of carbonate.

The thickness of the solum ranges from 30 to 46 inches. The thickness of the mollic epipedon ranges from 20 to more than 34 inches. The depth to free carbonates ranges from 22 to more than 40 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It ranges from medium acid to neutral. The Bt horizon has value of 3 or 4 (2 to 4 moist) and chroma of 1 or 2. It is slightly acid or neutral. It averages as low as 27 percent clay in some pedons and as high as 35 percent clay in others. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is silty clay loam, clay loam, or silt loam. It is mildly alkaline or moderately alkaline.

Oahe Series

The Oahe series consists of well drained soils that are moderately deep over sandy and gravelly material. These soils formed in glacial outwash or alluvial sediments on terraces. Permeability is moderate in the upper part of the profile and rapid in the underlying material. Slopes range from 0 to 6 percent.

Oahe soils are similar to Delmont and Orton soils and commonly are near Delmont, Eakin, Highmore, Mobridge, and Ree soils. Delmont soils are 14 to 20 inches deep over gravelly material. Eakin, Highmore, Mobridge, and Ree soils have an argillic horizon and do not have gravelly material within a depth of 40 inches. Eakin and Highmore soils are higher on the landscape than the Oahe soils. Ree soils are in positions on the landscape similar to those of the Oahe soils. The moderately well drained Mobridge soils are in swales. Orton soils have less clay in the upper part than the Oahe soils.

Typical pedon of Oahe loam, 0 to 2 percent slopes, 155 feet east and 2,165 feet north of the southwest corner of sec. 15, T. 107 N., R. 68 W.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable; neutral; abrupt smooth boundary.

Bw1—4 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, friable; neutral; clear smooth boundary.

Bw2—6 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, firm; few thin patchy shiny coatings on faces of peds; neutral; gradual wavy boundary.

Ck—14 to 24 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse

subangular blocky structure slightly hard, firm common fine accumulations of carbonate, strong effervescence mildly alkaline clear wavy boundary

2C—24 to 60 inches multicolored very gravelly loamy sand, single grain, loose strong effervescence moderately alkaline

The thickness of the solum and the depth to free carbonates range from 10 to 21 inches. The depth to sand and gravel ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon has value of 4 (2 or 3 moist) and chroma of 2. It is slightly acid or neutral. The Bw horizon has value of 4 (2 or 3 moist) and chroma of 2. It is neutral or mildly alkaline. It averages as low as 18 percent clay in some pedons and as high as 30 percent clay in others. The Ck horizon has value of 5 or 6 (4 moist) and chroma of 2 to 4. It is loam or sandy loam. It is mildly alkaline or moderately alkaline. The 2C horizon has hue of 10YR or 2.5Y, value of 5 to 8 (4 to 7 moist), and chroma of 2 to 4. It is very gravelly sand or very gravelly loamy sand. It is mildly alkaline or moderately alkaline.

Okaton Series

The Okaton series consists of shallow, well drained soils formed in clayey shale residuum on uplands. Permeability is slow. Slopes range from 15 to 40 percent.

Okaton soils are similar to Sansarc soils and commonly are near Betts, Java and Millboro soils. Betts and Java soils formed in loamy glacial till and contain less clay throughout than the Okaton soils. They are in positions on the landscape similar to those of the Okaton soils. Millboro soils do not have shale within a depth of 40 inches. They are on the less sloping, lower parts of the landscape. Sansarc soils contain more clay throughout than the Okaton soils.

Typical pedon of Okaton bouldery silty clay, 15 to 40 percent slopes, 450 feet north and 2,000 feet west of the southeast corner of sec. 29, T. 101 N., R. 69 W.

A—0 to 1 inch; grayish brown (2.5Y 5/2) bouldery silty clay, dark grayish brown (2.5Y 4/2) moist, weak fine granular structure slightly hard, friable, sticky and plastic, many fine roots, strong effervescence mildly alkaline; abrupt smooth boundary.

AC—1 to 4 inches; grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5/2) moist, weak fine and medium subangular blocky structure parting to weak fine granular, hard, firm, sticky and plastic, few fine shale chips, many fine roots, strong effervescence, mildly alkaline; clear wavy boundary.

C1—4 to 8 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) clay, dark grayish brown (2.5Y 4/2) crushing to grayish brown (2.5Y 5/2) moist, massive, hard, firm, sticky and plastic, many fine roots, strong effervescence, mildly alkaline; gradual smooth boundary.

C2—8 to 16 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) shaly clay, olive brown (2.5Y 4/4) moist, weak coarse subangular blocky structure, slightly hard, very firm, sticky and plastic, common fine roots, rock structure evident; common fine accumulations of carbonate, strong effervescence; mildly alkaline; clear wavy boundary.

Cr—16 to 60 inches; light brownish gray (2.5Y 6/2) and pale yellow (2.5Y 7/4) shale, dark grayish brown (2.5Y 4/2) and light yellowish brown (2.5Y 6/4) moist, common fine and medium nests of gypsum in seams, few fine roots in the upper part, strong effervescence, mildly alkaline.

The depth to bedrock ranges from 8 to 20 inches. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. The AC and C1 horizons have hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 to 4. The shale has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Oko Series

The Oko series consists of deep, well drained soils formed in firm, clayey glacial till on uplands. Permeability is slow. Slopes range from 2 to 7 percent.

Oko soils are similar to Beadle soils and commonly are near Glenham and Promise soils. Beadle and Glenham soils contain less clay throughout than the Oko soils. Promise soils do not have an argillic horizon. All of these soils are in positions on the landscape similar to those of the Oko soils.

Typical pedon of Oko loam, 2 to 7 percent slopes, 135 feet east and 2,250 feet north of the southwest corner of sec. 9, T. 105 N., R. 68 W.

A—0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist, weak medium platy structure parting to weak fine granular, slightly hard, very friable, slightly sticky, common very fine roots, neutral, clear smooth boundary.

Bt—5 to 12 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky, hard, firm, sticky and plastic, common very fine roots, neutral; abrupt smooth boundary.

Btk—12 to 19 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; common dark grayish brown (10YR 4/2) tongues, very dark grayish brown (10YR 3/2) moist; few very fine roots; shiny surfaces on peds; common fine and very fine accumulations of carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

BCk—19 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; few dark grayish brown (10YR 4/2) tongues, very dark grayish brown (10YR 3/2) moist; few very fine roots; common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

Ck—23 to 30 inches; light olive gray (5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; very hard, very firm, sticky and plastic; common fine roots; fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual smooth boundary.

C1—30 to 42 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; very hard, very firm, sticky and plastic; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—42 to 60 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; hard, firm, sticky and plastic; common fine and medium nests and seams of gypsum crystals; few fine accumulations of carbonate; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 15 to 26 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to free carbonates ranges from 5 to 16 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. The B horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2. It is neutral to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 to 3 dry or moist. It is mildly alkaline or moderately alkaline.

Opal Series

The Opal series consists of moderately deep, well drained soils formed in clayey shale residuum on uplands. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 1 to 25 percent.

Opal soils are similar to Millboro and Promise soils and commonly are near Promise and Sansarc soils. Millboro and Promise soils do not have shale within a depth of 40 inches. Sansarc soils are 4 to 20 inches deep over shale. They are on the steeper, more convex parts of the landscape.

Typical pedon of Opal silty clay, 6 to 11 percent slopes, 2,200 feet north and 180 feet west of the southeast corner of sec. 15, T. 106 N., R. 69 W.

A—0 to 5 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic; neutral; many very fine roots; clear wavy boundary.

Bw—5 to 15 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky; extremely hard, very firm, sticky and plastic; common very fine roots; neutral; gradual wavy boundary.

BC—15 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; extremely hard, very firm, sticky and plastic; common very fine roots; very slight effervescence; mildly alkaline; clear wavy boundary.

C1—22 to 32 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; few fine prominent yellowish red (5YR 5/6) mottles; massive; very hard, very firm, sticky and plastic; few very fine roots; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

C2—32 to 37 inches; light brownish gray (2.5Y 6/2) clay, olive (5Y 5/3) moist; few fine prominent yellowish red (5YR 5/6) mottles; massive; hard, firm, sticky and plastic; few very fine roots; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

Cr—37 to 60 inches; light gray (2.5Y 7/2) shale, grayish brown (2.5Y 5/2) moist; brittle; few fine accumulations of carbonate; mildly alkaline.

The thickness of the solum ranges from 20 to 27 inches. The depth to free carbonates is less than 18 inches. The thickness of the mollic epipedon ranges from 7 to 18 inches. The depth to bedrock ranges from 20 to 40 inches. The control section averages as low as 60 percent clay in some pedons and as high as 65 percent clay in others.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is clay or silty clay. It ranges from slightly acid to mildly alkaline. The B horizon has hue of 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 to 3. It ranges from neutral to moderately alkaline. In some pedons it has accumulations of salts in the lower part. The C horizon

has hue of 2.5Y or 5Y, value of 4 to 6 (4 or 5 moist), and chroma of 2 or 3. The Cr horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7 dry or moist, and chroma of 1 to 3.

Orton Series

The Orton series consists of well drained soils that are moderately deep over gravelly sand. These soils formed in glacial outwash or alluvial sediments on uplands and terraces. Permeability is moderately rapid in the upper part of the profile and rapid in the underlying material. Slopes range from 0 to 25 percent.

Orton soils are similar to Delmont and Oahe soils and commonly are near Delmont, Lowry, Lowry Variant, and Schamber soils. Delmont soils are 14 to 20 inches deep over gravelly material. The silty Lowry soils are more than 40 inches deep over gravelly material. Lowry Variant soils have less sand in the upper part than the Orton soils. Lowry and Lowry Variant soils are in positions on the landscape similar to those of the Orton soils. Oahe soils contain more clay in the subsoil than the Orton soils. Schamber soils do not have a mollic epipedon and have gravelly material within a depth of 10 inches. They are on ridges and terrace scarps.

Typical pedon of Orton loam, 0 to 2 percent slopes, 990 feet west and 150 feet north of the southeast corner of sec. 9, T. 107 N., R. 72 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; soft, very friable; neutral; abrupt smooth boundary.

Bw—6 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; gradual wavy boundary.

BCk—14 to 22 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common fine accumulations of carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

Ck—22 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

C1—30 to 37 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual wavy boundary.

2C2—37 to 60 inches; multicolored very gravelly sand; single grain; loose; coatings of carbonate on pebbles; mildly alkaline; strong effervescence.

The thickness of the solum ranges from 13 to 25 inches. The depth to free carbonates ranges from 7 to 15 inches. The depth to gravelly material ranges from 20 to 40 inches. The thickness of the mollic epipedon ranges from 7 to 15 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. The Bw horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. It is loam or silt loam. The Ck horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 to 4. It is fine sandy loam, sandy loam, or loam. The 2C horizon is multicolored very gravelly loamy fine sand, very gravelly loamy sand, very gravelly sand, gravelly loamy sand, or gravelly sand.

Plankinton Series

The Plankinton series consists of deep, poorly drained soils formed in clayey and silty alluvium in depressions in the uplands. Permeability is very slow. Slopes are less than 1 percent.

Plankinton soils are similar to Kolls and Worthing soils and commonly are near Eakin, Highmore, Mobridge, and Worthing soils. The well drained Eakin and Highmore soils are higher on the landscape than the Plankinton soils. Kolls soils contain more clay throughout than the Plankinton soils. The moderately well drained Mobridge soils are in swales. Worthing soils do not have an E horizon.

Typical pedon of Plankinton silt loam, 120 feet north and 1,165 feet west of the southeast corner of sec. 20, T. 102 N., R. 68 W.

A—0 to 4 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; many fine and very fine roots; slightly acid; clear smooth boundary.

E—4 to 6 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; moderate thin platy structure; soft, very friable; common very fine roots; slightly acid; abrupt smooth boundary.

Bt—6 to 24 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common very fine roots; neutral; gradual wavy boundary.

BCk1—24 to 35 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak coarse and medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common very fine roots; few fine to coarse accumulations of carbonate; neutral; clear wavy boundary.

BCk2—35 to 39 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak coarse and medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few very fine roots; few fine and medium nests of gypsum and other salts; few fine and medium accumulations of carbonate; neutral; clear wavy boundary.

Ckzg—39 to 57 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; common fine and medium nests of gypsum and other salts; few fine and medium accumulations of carbonate; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg—57 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/4) mottles; massive; hard, firm, sticky and plastic; few very fine roots; few fine and medium nests of gypsum and other salts; few fine and medium accumulations of carbonate; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 36 to more than 50 inches. The thickness of the mollic epipedon ranges from 27 to more than 50 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The E horizon has value of 5 or 6 (3 or 4 moist) and chroma of 1 or 2. The A and E horizons range from medium acid to neutral. The Bt horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is clay, silty clay, silty clay loam, or clay loam. It ranges from slightly acid to moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 4 to 7 (3 to 5 moist), and chroma of 1 to 4. It is clay loam, silty clay loam, silty clay, or clay. It is mildly alkaline or moderately alkaline. It has few or common fine and medium accumulations of carbonates. In some pedons the BC and C horizons do not have accumulations of gypsum.

Promise Series

The Promise series consists of deep, well drained soils formed in sediments weathered from clayey shale on uplands, fans, and terraces. When dry, these soils are characterized by cracks, which are 0.5 inch to 2.0 inches wide and several feet long and extend through the subsoil. Permeability is very slow. Slopes range from 0 to 6 percent.

Promise soils are similar to Millboro and Opal soils and commonly are near Carter, Hurley, and Opal soils. Carter and Hurley soils are on flats and foot slopes. Carter soils contain more salts throughout than the Promise soils. Hurley soils have a natric horizon. Millboro soils have an argillic horizon. Opal soils are 20 to 40 inches deep over shale.

Typical pedon of Promise silty clay, 0 to 2 percent slopes, 125 feet south and 335 feet west of the northeast corner of sec. 33, T. 106 N., R. 69 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, sticky and plastic; mildly alkaline; abrupt smooth boundary.

Bw1—7 to 10 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium and coarse blocky; very hard, firm, sticky and plastic; common dark gray (10YR 4/1) tongues, very dark gray (10YR 3/1) moist; shiny surfaces on peds; moderately alkaline; clear wavy boundary.

Bw2—10 to 19 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse blocky; very hard, very firm, sticky and plastic; common dark gray (10YR 4/1) tongues, very dark gray (10YR 3/1) moist; common shiny surfaces on peds; strong effervescence; moderately alkaline; clear wavy boundary.

BCk—19 to 33 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse blocky; very hard, very firm, sticky and plastic; few dark gray (10YR 4/1) tongues, very dark gray (10YR 3/1) moist; common medium and coarse accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—33 to 42 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine accumulations of carbonate; strong effervescence; strongly alkaline; diffuse wavy boundary.

Cy—42 to 56 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine faint light olive brown (2.5Y 5/4) mottles; massive; slightly hard, firm, very sticky and very plastic; few fine distinct stains, strong brown (7.5YR 5/6) moist; common fine to coarse nests and seams of gypsum crystals; strong effervescence; moderately alkaline; clear wavy boundary.

C'—56 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/8) mottles; massive; slightly hard, firm, very sticky and very plastic; about 15 percent fragments of shale; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 35 inches. The thickness of the mollic epipedon ranges from 7 to 15 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is neutral or mildly alkaline. The B horizon has value of 4 to 6 (2 to 4 moist) and chroma of 1 to 3. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is clay or silty clay. It is moderately alkaline or strongly alkaline.

Ree Series

The Ree series consists of deep, well drained soils formed in loamy sediments on terraces and uplands. Permeability is moderate. Slopes range from 0 to 7 percent.

Ree soils are similar to Glenham soils and commonly are near Delmont, Glenham, Java, Lane, and Oahe soils. Delmont and Oahe soils are underlain by gravelly material. They are in positions on the landscape similar to those of the Ree soils. Glenham and Java soils are not so stratified in the C horizon as the Ree soils. Java soils are on the steeper, more convex parts of the landscape. The moderately well drained Lane soils contain more clay in the subsoil than the Ree soils. Also, they are lower on the landscape.

Typical pedon of Ree loam, 0 to 3 percent slopes, 130 feet south and 1,000 feet west of the northeast corner of sec. 27, T. 106 N., R. 68 W.

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak medium and fine granular structure; soft, friable; neutral; abrupt smooth boundary.

Bt1—7 to 15 inches, dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B12—15 to 20 inches, brown (10YR 5/3) and dark grayish brown (10YR 4/2) clay loam, dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common fine and few medium accumulations of carbonate; slight effervescence; mildly alkaline; diffuse wavy boundary.

Ck—20 to 34 inches, light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, slightly sticky and slightly plastic; common medium and fine accumulations of carbonate; slight effervescence; moderately alkaline; clear wavy boundary.

C1—34 to 44 inches, light brownish gray (2.5Y 6/2) sandy loam, olive brown (2.5Y 4/4) moist; massive, slightly hard, friable; few fine and medium accumulations of carbonate; moderately alkaline; slight effervescence; gradual wavy boundary.

C2—44 to 50 inches, light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) moist; massive; hard, friable; few fine, medium and coarse accumulations of carbonate; slight effervescence; moderately alkaline; gradual wavy boundary.

C3—50 to 60 inches, light brownish gray (2.5Y 6/2) fine sandy loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable; few fine accumulations of carbonate; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 16 to 32 inches. The depth to free carbonates ranges from 12 to 25 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 to 4. It averages as low as 27 percent clay in some pedons and as high as 35 percent clay in others. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It typically ranges from sandy loam to clay loam, but in some pedons it has gravelly material at a depth of 40 to 60 inches. It is mildly alkaline or moderately alkaline.

Sansarc Series

The Sansarc series consists of shallow, well drained soils formed in clayey shale residuum on uplands. Permeability is slow. Slopes range from 6 to 40 percent.

Sansarc soils are similar to Okaton soils and commonly are near Bullcreek, Chantier, Gettys, Opal, and Sully soils. Bullcreek soils are more than 40 inches deep over shale. They are on foot slopes. Chantier soils are not so friable as the Sansarc soils and contain more salts. They are on the less sloping parts of the landscape. Gettys soils contain more sand and less clay throughout than the Sansarc soils. They are in positions on the landscape similar to those of the Sansarc soils. Okaton soils contain less clay throughout than the Sansarc soils. Opal soils are 20 to 40 inches deep over shale bedrock. They are on the less sloping, smooth parts of the landscape. The deep Sully soils formed in loess. They are on uplands adjacent to the breaks along the Missouri River.

Typical pedon of Sansarc clay, in an area of Sansarc-Opal clays, 20 to 40 percent slopes, 2,500 feet south and 400 feet east of the northwest corner of sec. 25, T. 106 N., R. 71 W.

A—0 to 4 inches, grayish brown (2.5Y 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine and

very fine granular; slightly hard, friable, sticky and plastic; common fine and very fine roots; neutral; clear wavy boundary

C1—4 to 12 inches, light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist, weak medium subangular structure parting to weak fine and very fine granular; hard, friable, sticky and plastic; many fine fragments of shale; common fine and very fine roots; slight effervescence; mildly alkaline; gradual wavy boundary

C2—12 to 15 inches, light brownish gray (2.5Y 6/2) very shaly clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine and very fine roots; about 50 percent weathered fragments of shale; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary

Cr—15 to 60 inches, light gray (5Y 7/2) shale, grayish brown (2.5Y 5/2) moist; mildly alkaline.

The depth to shale bedrock ranges from 4 to 20 inches. The control section averages as low as 55 percent clay in some pedons and as high as 65 percent clay in others. The A horizon has value of 5 or 6 (3 to 5 moist) and chroma of 2. It is neutral to moderately alkaline. The C horizon has hue of 5Y, 2.5Y, or 10YR. It is mildly alkaline or moderately alkaline.

Schamber Series

The Schamber series consists of excessively drained soils that are very shallow over sandy and gravelly material. These soils formed in gravelly outwash on terrace remnants. Permeability is rapid. Slopes range from 9 to 30 percent.

These soils are taxadjuncts to the Schamber series because they receive somewhat more precipitation than is definitive for the series.

Schamber soils are similar to Delmont soils and commonly are near Delmont, Oahe, Orton, and Sully soils. Delmont soils are 14 to 20 inches deep over gravelly material. Oahe and Orton soils are 20 to 40 inches deep over gravelly material. They are on the less sloping parts of the landscape. The deep, silty Sully soils formed in loess. They are in positions on the landscape similar to those of the Schamber soils.

Typical pedon of Schamber loam, 9 to 30 percent slopes, 730 feet east and 265 feet south of the northwest corner of sec. 11, T. 106 N., R. 68 W.

A—0 to 3 inches, dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; many fine and very fine roots; strong effervescence; mildly alkaline; clear smooth boundary

Ck—3 to 20 inches, multicolored gravelly loamy sand; single grain; loose; few very fine roots; common coatings of carbonate on the lower sides of pebbles; strong effervescence; moderately alkaline; gradual wavy boundary

C—20 to 60 inches, multicolored; gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The depth to sandy and gravelly material is less than 10 inches. The A horizon has value of 4 to 6 (2 or 3 moist) and chroma of 2 to 4. It is slightly acid to moderately alkaline. The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is gravelly sand, very gravelly sand, gravelly loamy sand, or very gravelly loamy sand. The content of gravel ranges from 35 to more than 50 percent.

Sully Series

The Sully series consists of deep, well drained soils formed in silty loess on uplands. Permeability is moderate. Slopes range from 6 to 40 percent.

Sully soils commonly are near Lowry, Sansarc, Schamber, and Uly soils. Lowry and Uly soils have a mollic epipedon. They are on the less sloping parts of the landscape. Sansarc soils are 4 to 20 inches deep over shale. They are in positions on the landscape similar to those of the Sully soils. Schamber soils are less than 10 inches deep over gravelly material. They are on ridges and terrace scarps.

Typical pedon of Sully silt loam, in an area of Sully-Lowry silt loams, 9 to 25 percent slopes, 660 feet east and 1,400 feet north of the southwest corner of sec. 36, T. 104 N., R. 72 W.

A—0 to 4 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; common fine roots; mildly alkaline; gradual wavy boundary

C1—4 to 20 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; very weak coarse prismatic structure parting to weak coarse and medium subangular blocky; soft, very friable; common fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; diffuse wavy boundary

C2—20 to 60 inches, light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; massive; soft, very friable; few fine accumulations of carbonate; strong effervescence; moderately alkaline.

The depth to free carbonates is less than 5 inches. The soils are silt loam or very fine sandy loam throughout.

The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is neutral or mildly alkaline. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

Uly Series

The Uly series consists of deep, well drained soils formed in loess on uplands (fig. 12). Permeability is moderate. Slopes range from 0 to 9 percent.

Uly soils are similar to Highmore and Lowry soils and commonly are near Lowry, McClure, and Mobridge soils. Highmore soils have an argillic horizon. Lowry soils contain less clay throughout than the Uly soils. McClure soils contain more clay in the subsoil than the Uly soils. They are in positions on the landscape similar to those of the Uly soils. The moderately well drained Mobridge soils are in swales.

Typical pedon of Uly silt loam, 2 to 6 percent slopes, 85 feet north and 1,820 feet west of the southeast corner of sec. 1, T. 105 N., R. 71 W.

Ap—0 to 6 inches, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; neutral; abrupt smooth boundary.

A—6 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable; mildly alkaline; gradual smooth boundary.

Bw—9 to 17 inches, brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; mildly alkaline; clear wavy boundary.

BCk—17 to 23 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist, weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline, gradual wavy boundary.

Ck—23 to 55 inches, pale brown (10YR 6/3) silt loam, olive brown (2.5Y 4/4) moist, massive; slightly hard, very friable; few fine roots; common fine and few medium accumulations of carbonate; strong effervescence; mildly alkaline; diffuse wavy boundary.

C—55 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; soft, very friable; common fine accumulations of carbonate, strong effervescence; moderately alkaline.

The thickness of the solum ranges from 12 to 30 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches. The depth to free carbonates ranges from 12 to 25 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 2. The B horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3. The A and B horizons range from slightly acid to mildly alkaline. They are silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

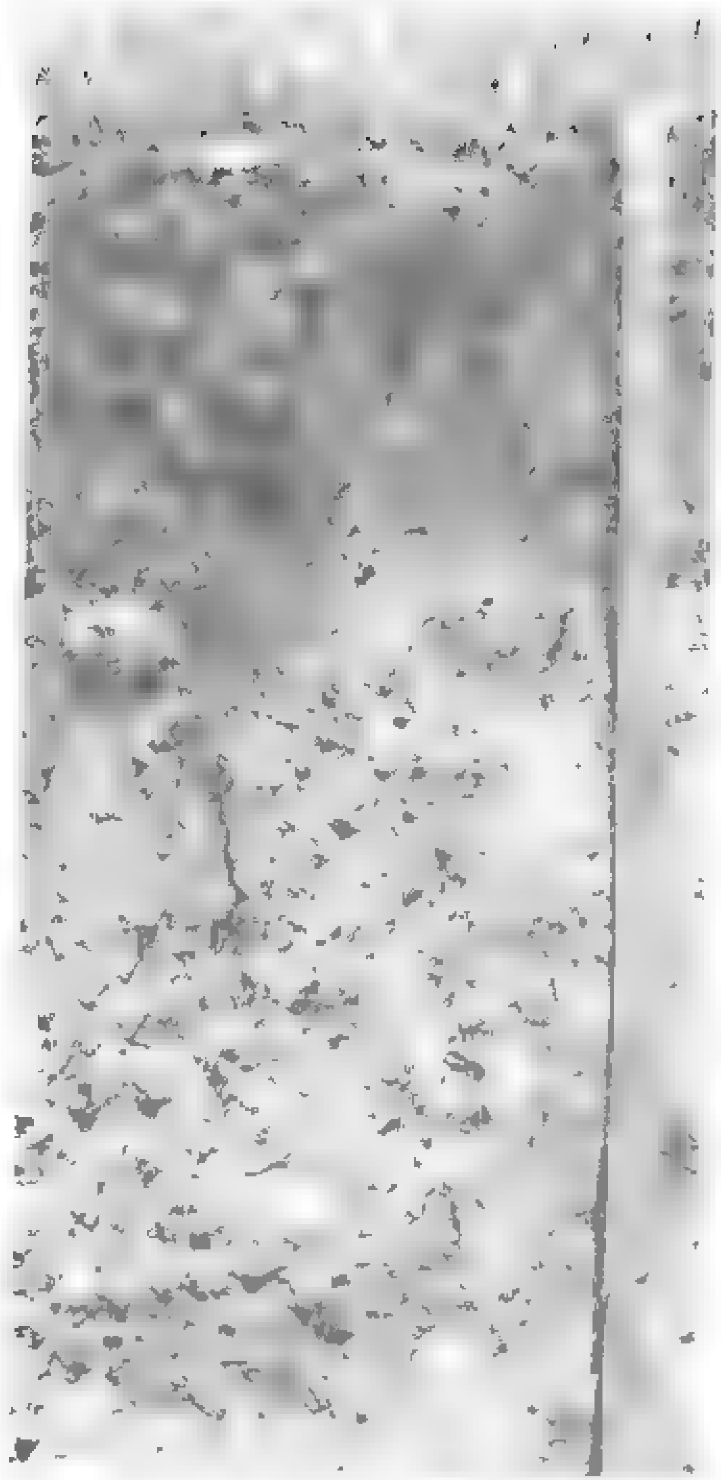

Figure 12.—Profile of Uly silt loam, 0 to 2 percent slopes.

Wendte Series

The Wendte series consists of deep moderately well drained soils formed in alluvium on flood plains Permeability is slow Slopes range from 0 to 3 percent.

Wendte soils commonly are near Bullcreek and Promise soils The nearby soils are on foot slopes and uplands They are not stratified Also Bullcreek soils contain more salts throughout than the Wendte soils

Typical pedon of Wendte silty clay channeled 350 feet south and 500 feet west of the northeast corner of sec 28, T 106 N. R 70 W

A1—0 to 2 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist, weak medium and thick platy structure hard firm sticky and plastic, coatings of pale brown (10YR 6 3) fine sand grains on plates; common fine roots, slight effervescence; mildly alkaline; clear smooth boundary

A2—2 to 5 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; slight effervescence; mildly alkaline; clear smooth boundary

C1—5 to 14 inches grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist weak medium subangular blocky structure weak bedding planes evident hard, firm sticky and plastic common fine roots, slight effervescence; mildly alkaline abrupt wavy boundary

C2—14 to 26 inches grayish brown (2 5Y 5/2) clay loam, very dark grayish brown (2 5Y 3/2) moist moderate medium subangular blocky structure; hard, firm, sticky and plastic, common fine roots strong effervescence mildly alkaline gradual wavy boundary

C3—26 to 40 inches, grayish brown (2 5Y 5/2) and light brownish gray (2 5Y 6/2) silty clay dark grayish brown (2 5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots strong effervescence, mildly alkaline gradual wavy boundary

C4—40 to 60 inches light brownish gray (2 5Y 6/2) silty clay dark grayish brown (2 5Y 4/2) moist massive, hard, firm sticky and plastic, few fine roots, strong effervescence, mildly alkaline

Reaction is mildly alkaline or moderately alkaline throughout the profile The control section averages as low as 35 percent clay in some pedons and as high as 50 percent clay in others

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has value of 4 to 6 (3 to 5 moist) and chroma of 1 to 3. In some pedons it has layers of coarser textured material less than 2 inches thick.

Worthing Series

The Worthing series consists of deep, very poorly drained soils formed in alluvium in depressions in the uplands Permeability is slow Slopes are less than 1 percent

Worthing soils are similar to Kolls and Plankinton soils and commonly are near Beadle, Eakin, Highmore, and Jerauld soils. The well drained Beadle, Eakin, and Highmore soils are higher on the landscape than the Worthing soils The somewhat poorly drained Jerauld soils have a natric horizon They are in small pits and depressions. Kolls and Plankinton soils are poorly drained

Typical pedon of Worthing silty clay loam, 75 feet north and 2,560 feet east of the southwest corner of sec. 20, T 101 N., R. 68 W

A—0 to 5 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; extremely hard firm, sticky and plastic common fine roots, organic mulch about 1 inch thick on the surface common fine brownish yellow (10YR 6/6) root stains, slightly acid, clear smooth boundary

Bt—5 to 18 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium blocky extremely hard, very firm sticky and plastic common fine roots few concretions of iron and manganese oxide few fine brownish yellow (10YR 6/6) stains neutral, gradual smooth boundary

Btg1—18 to 36 inches, gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium blocky, extremely hard very firm sticky and plastic common fine roots few medium concretions of iron and manganese oxide; few fine brownish yellow (10YR 6/6) root stains; neutral, clear wavy boundary

Btg2—36 to 40 inches, gray (5Y 5/1) silty clay very dark gray (5Y 3/1) moist weak coarse prismatic structure parting to weak medium blocky extremely hard, very firm sticky and plastic few fine roots few fine accumulations of carbonate, slight effervescence, moderately alkaline gradual wavy boundary

BCg—40 to 46 inches, gray (5Y 5/1) silty clay very dark gray (5Y 3/1) moist weak coarse prismatic structure parting to weak medium blocky extremely hard, very firm, sticky and plastic, few fine roots few fine accumulations of carbonate slight effervescence moderately alkaline gradual wavy boundary

Ckg—46 to 60 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; massive; extremely hard, very firm, sticky and plastic; common fine accumulations of carbonate; strong effervescence; mildly alkaline

The thickness of the solum ranges from 35 to 50 inches. The mollic epipedon is more than 35 inches thick. The depth to free carbonates ranges from 35 to more than 60 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1. It is slightly acid or neutral. The Bt horizon has hue of 10YR, 2.5Y, or 5Y value of 4 or 5 (2 or 3 moist), and chroma of 1. It is silty clay or clay. It ranges from neutral to moderately alkaline. The C horizon is silty clay, silty clay loam, or clay. It is mildly alkaline or moderately alkaline. It has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2.

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Brule and Buffalo Counties.

Climate

Climate directly influences the rate of chemical and physical weathering. Brule and Buffalo Counties have a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to a depth of 18 inches or more. The climate generally is uniform throughout the survey area and thus as a separate factor does not differentiate between the soils within the area. Additional climatic data are given under the heading "General Nature of the Survey Area."

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Brule and Buffalo Counties the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer in many soils has a moderate or high content of organic matter. Mobridge soils are an example.

Earthworms, insects, and burrowing animals help to keep the soils open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients that plants use as food.

Parent Material

Parent material is the unconsolidated organic and mineral material in which soil forms. It determines many of the chemical and physical characteristics of the soil, such as color, texture, reaction, and consistence. The rate of soil formation is more rapid in the more friable loamy and silty parent material than in other kinds of parent material. Also, more changes take place, and the horizons are more distinct.

Many of the soils in Brule and Buffalo Counties formed in glacial material derived from preglacial formations of granite, gneiss, limestone, and sandstone and from material weathered from the underlying Pierre Shale. Some glacial deposits consist of material sorted either by water as the material was deposited or by wind and water after it was deposited; others consist of unsorted material, or glacial till.

The glacial till generally is loamy or silty. Most of the silty glacial till occurs in Brule County. The loamy glacial till generally is in the northeastern part of Buffalo County but it also is in a few scattered small areas throughout Brule County. The loamy glacial till generally has scattered stones and boulders throughout.

The silty glacial till was deposited on glacial ice and then reworked by water as the glacier melted. Highmore soils formed in silty glacial till. Eakin soils formed in a thin mantle of silty glacial till over loamy glacial till. Loamy glacial till is a mixture of clay, silt, sand, and gravel that contains few to many cobblestones and boulders. The content of pebbles and cobblestones is higher than that in the silty glacial till. The proportion of each kind of material is determined by the kind of material picked up by the glacier. Among the soils formed in loamy glacial till are Betts, Java, and Glenham.

The bedrock in the survey area dominantly is marine shale of the Pierre Formation that was deposited during

the Late Cretaceous Period. The Pierre Shale is dark gray to light gray and has beds of bentonite and seams of limestone, iron, and manganese concretions. Opal and Sansarc are examples of soils formed in material weathered from the Pierre Formation.

Glacial outwash is sandy, gravelly, and loamy material deposited by glacial melt water. Delmont and Oahe soils formed in loamy material underlain by sand and gravel within a depth of 40 inches. They are on widely scattered terraces throughout the survey area.

Loess mantles the uplands above the breaks adjacent to Lake Francis Case and Lake Sharpe. Lowry and Uly soils formed in this silty loess.

Mobridge, Tetonka, and Worthing are examples of soils formed partly or entirely in local alluvium washed from the adjacent sloping soils on uplands. Bon soils formed in alluvium deposited by streams.

Relief

Relief affects soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Betts soils, much of the rainfall is lost through runoff and does not penetrate the surface. Much of the surface soil is lost through erosion. As a result, these soils have a thin surface layer and are calcareous at or near the surface. Runoff is slower on Eakin, Glenham, Highmore, and other less sloping soils, and more rainfall penetrates the surface. These soils are calcareous at a greater depth than the Betts soils. Also, the horizons in which organic matter accumulates are thicker.

The Mobridge soils in swales receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the slightly higher adjacent Highmore soils. In low areas where drainage is impeded, the fluctuating water table favors the concentration of salts in Durrstein, Eges, and other soils. Plankinton and Kolls soils are in depressions where water ponds. They have the colors characteristic of poorly drained soils.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that have formed. The degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. In Brule and Buffalo Counties, these are the Eakin, Glenham, and Highmore soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Betts and Sully soils are examples of young soils that are subject to natural erosion, and Bon soils are an example of young alluvial soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Growing crops in rows that follow the contour.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes recognized in this survey are:

	Inches
Deep	more than 40
Moderately deep	20 to 40
Shallow	less than 20

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water through cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that are not a part of the original plant community that encroach into an area and grow after the native vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface soil.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of

species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is [illegible] percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes recognized in this survey area are as follows:

	Percent
Level	0 to 1
Nearly level	0 to 2
Gently undulating	0 to 3
Gently sloping	2 to 6
Moderately sloping	6 to 9
Strongly sloping	9 to 15
Moderately steep	15 to 25
Steep	25 to 40

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B

horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[illegible]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]
[illegible] VALLEY											
January----	24.3	1.5	12.9	53	-30	0	0.28	0.05	0.44	1	3.4
February---	31.6	8.8	20.2	62	-26	25	.44	.11	.70	2	[illegible]
March------	42.0	19.0	30.5	77	-13	87	.74	.16	1.19	2	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May--------	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.24	[illegible]	[illegible]	[illegible]
June-------	81.7	54.5	68.1	102	36	843	2.99	1.59	4.21	6	.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	[illegible]
August-----	87.9	58.0	73.0	105	41	1,023	1.98	.84	2.93	4	.0
September--	77.4	47.2	62.3	101	26	669	1.47	.32	2.38	3	.0
October----	64.9	35.8	50.4	90	13	338	1.13	.29	1.80	3	[illegible]
November---	44.8	20.7	32.8	74	-8	30	.51	.08	.82	1	[illegible]
December---	31.2	9.2	20.2	60	-22	14	.34	.09	.59	2	4.8
Yearly:											
Average--	[illegible]	[illegible]	45.8	---	---	---	---	---	---	---	---
Extreme--	---	---	[illegible]	[illegible]	[illegible]	---	---	---	---	---	[illegible]
Total----	[illegible]	---	---	---	---	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]											
January----	28.6	6.1	17.4	61	-24	16	.42	.18	.61	2	4.2
February---	36.2	13.3	24.8	67	-16	31	.73	.21	1.14	3	6.0
March------	47.0	23.0	35.0	80	-5	119	.99	.27	1.55	3	5.2
April------	62.9	36.9	49.9	90	15	308	2.46	.99	3.71	5	1.3
May--------	75.5	48.0	61.8	94	28	676	3.25	1.74	4.57	7	.0
June-------	84.6	58.2	71.4	103	43	942	3.63	2.01	5.06	7	.0
July-------	91.8	64.0	77.9	107	48	1,175	2.40	.97	3.60	5	.0
August-----	89.7	61.7	75.7	105	46	1,107	1.96	.74	2.96	5	.0
September--	78.6	51.6	65.1	100	32	753	1.79	.61	2.78	4	.0
October----	66.6	40.2	53.4	90	22	423	1.08	.32	1.71	3	.1
November---	47.5	25.6	36.6	73	1	24	.71	.08	1.20	2	2.5
December---	33.4	13.2	23.3	62	-17	7	.63	.20	.98	2	5.5
Yearly:											
Average--	61.9	36.8	49.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	108	-24	---	---	---	---	---	---
Total----	---	---	---	---	---	5,581	20.05	15.45	24.35	48	24.8

* A growing degree day is a unit of heat available for plant growth. It can be [illegible] by adding the [illegible] temperatures, [illegible] the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-79 at Gann Valley and and in the period 1963-78 at Chamberlain]

Probability	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
GANN VALLEY			
Last freezing temperature in spring:			
1 year in 10 later than--	May 10	May 23	May 31
2 years in 10 later than--	May 4	May 18	May 26
5 years in 10 later than--	April 23	May 9	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	September 25	September 20	September 8
2 years in 10 earlier than--	October 1	September 25	September 13
5 years in 10 earlier than--	October 12	October 6	September 21
[illegible]			
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3.—GROWING SEASON

[Data were recorded in the period 1951-79 at Gann Valley and in the period 1963-78 at Chamberlain]

Probability	[illegible]	[illegible]	[illegible]
GANN VALLEY			
9 years in 10	151	127	112
8 years in 10	158	134	117
5 years in 10	171	149	127
2 years in 10	185	164	136
1 year in 10	192	172	142
CHAMBERLAIN			
9 years in 10	183	168	147
8 years in 10	190	174	153
5 years in 10	203	186	166
2 years in 10	217	199	180
1 year in 10	[illegible]	[illegible]	[illegible]

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Brule County	Buffalo County	Total Area	Total Extent
		Acres	Acres	Acres	Pct
Ar	Artesian silty clay loam	[illegible]	[illegible]	[illegible]	*
[illegible]	Beadle loam, 2 to 6 percent slopes	[illegible]	1,[illegible]	[illegible]	[illegible]
[illegible]	Beadle loam, 6 to 9 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Beadle-Jerauld complex, 1 to 5 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bon lo[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Carter-Promise complex	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Cavo-Jerauld silt loams	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Chantier-Sansarc clays, 2 to 15 percent s[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
DeD	Delmont loam, 6 to 15 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
Do	Dorna silt loam	[illegible]	[illegible]	[illegible]	[illegible]
Du	Durrstein silt l[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EkA	Eakin-DeGrey silt loams, 0 to 3 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Egas silty clay lo[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Egas Variant silty clay loam	[illegible]	[illegible]	[illegible]	*
Fa	Farnsworth silt lo[illegible]	[illegible]	[illegible]	[illegible]	*
GeE	Gettys clay loam, 9 to 25 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
GeF	Gettys clay loam, 25 to 40 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
GnA	Glenham loam, 0 to 3 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HkB	Highmore-Java complex, 1 to 5 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]
HkC	Highmore-Java complex, 5 to 9 percent slopes	23,890	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LoA	Lowry silt loam, 0 to 2 percent slopes	1,025	[illegible]	[illegible]	[illegible]
LoB	Lowry silt loam, 2 to 6 percent slopes	690	2,350	3,040	0.4
[illegible]	Lowry Variant silt loam, 0 to 2 percent slopes	0	[illegible]	[illegible]	[illegible]
LvB	Lowry Variant silt loam, 2 to 6 percent slopes	0	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
McC	McClure silt loam, 6 to 11 percent slopes	580	565	1,145	0.1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MoA	Mobridge silt loam	17,5[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OkB	Oko loam, 2 to 7 percent slopes	1,140	[illegible]	[illegible]	[illegible]
OmB	Opal silty clay, 2 to 6 percent slopes	2,525	21,[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OpB	Opal clay, saline, 1 to 6 percent slopes	0	8,115	8,115	1.0
Or	Orthents, loamy	260	[illegible]	[illegible]	*
OtA	Orton loam, 0 to 2 percent slopes	0	615	615	0.1
[illegible]	Orton loam, 2 to 6 percent slopes	0	30[illegible]	[illegible]	*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pk	Plankinton silt loam	27,810	4,280	32,090	3.9
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ReA	Ree loam, 0 to 3 percent slopes	2,305	4,080	[illegible]	[illegible]
ReB	Ree loam, 3 to 7 percent slopes	2,165	2,110	4,275	0.5
RsF	Rock outcrop-Sansarc complex, 15 to 40 percent slopes	5,000	2,905	[illegible]	[illegible]
SaE	Sansarc-Opal clays, 12 to 20 percent slopes	4,060	27,225	[illegible]	[illegible]
SaF	Sansarc-Opal clays, 20 to 40 percent slopes	13,760	6,835	[illegible]	[illegible]
SdE	Schamber loam, 9 to 30 percent slopes	450	3,[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SoE	Sully-Lowry silt loams, 9 to 25 percent slopes	1,120	1,040	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
UmA	Uly silt loam, 0 to 2 percent slopes	3,140	2,090	[illegible]	[illegible]

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	[illegible] County	[illegible]	[illegible]	[illegible]
		Acres	[illegible]	Area	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wd	[illegible] silty clay	[illegible]	[illegible]	[illegible]	[illegible]
We	[illegible] silty clay, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Water (less than 40 acres)	[illegible]	[illegible]	[illegible]	[illegible]
	Big Bend [illegible]		[illegible]	[illegible]	[illegible]
	Total land area	[illegible]	[illegible]	[illegible]	
	Open water areas (more than 40 acres)	[illegible]	[illegible]	[illegible]	
	Total area	[illegible]	[illegible]	[illegible]	[illegible]

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. [illegible] prime farmland [illegible] prime farmland only when [illegible] are specified in parentheses after the soil name]

Map symbol	Soil name
Ar	Artesian silty clay loam (where drained)
BeB	Beadle loam, [illegible] to 5 percent slopes (where irrigated)
Bn	Bon loam
Do	Dorne silt loam (where irrigated)
GhA	Glenham loam, 0 to 3 percent slopes (where irrigated)
[illegible]	[illegible] (where irrigated)
HgB	Highmore-Java complex, 1 to 5 percent slopes (where irrigated)
[illegible]	[illegible] percent slopes (where irrigated)
[illegible]	[illegible] (where irrigated)
[illegible]	[illegible] (where irrigated)
[illegible]	[illegible]
[illegible]	[illegible] (where irrigated)
[illegible]	[illegible] (where irrigated)
McB	McClure silt loam, 2 to 6 percent slopes (where irrigated)
[illegible]	[illegible] silty clay loam, [illegible] (where irrigated)
MbB	Millboro silty clay loam, 2 to 6 percent slopes (where irrigated)
MoA	Mobridge silt loam
[illegible]	[illegible] percent slopes (where irrigated)
OtA	Orton loam, 0 to 2 percent slopes (where irrigated)
OtB	Orton loam, 2 to 6 percent slopes (where irrigated)
ReA	Ree loam, 0 to [illegible] (where irrigated)
ReB	Ree loam, 3 to [illegible] (where irrigated)
UaA	Uly silt loam, [illegible] (where irrigated)
UaB	Uly silt loam, [illegible] (where irrigated)
Wd	Wendte silty [illegible] (where irrigated)

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.

Soil name and map symbol	Land capability	Corn	Oats	Spring wheat	Winter wheat	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Bu	Tons	AUM
Ar[illegible]: Artesian	IIIe-3	---	42	28	23	39	3.0	5.0
BaB: Beadle	IIIe-3	38	49	29	36	44	2.0	3.3
BaC: Beadle	IVe-7	33	44	26	30	39	1.7	2.8
BgB: [illegible]	IIIe-3	---	36	---	25	35	1.4	---
Jerauld	VIs-1							
BhF: [illegible]	VIIe-3	---	---	---	---	---	---	---
[illegible]	VIe-3							
Bn: [illegible]	IIc-3	60	69	---	41	67	3.3	5.5
B[illegible]: [illegible]	VIw-1	---	---	---	---	---	---	---
B[illegible]: [illegible]	VIs-5	---	---	---	---	---	---	---
Ca[illegible]: [illegible]	VIs-1	---	---	---	---	---	---	---
[illegible]: [illegible]	VIs-1	---	---	---	---	---	---	---
[illegible]	[illegible]							
C[illegible]: Cavo	IVs-2	---	---	---	---	---	0.7	1.2
Jerauld	VIs-1							
CeD: [illegible]	VIe-8	---	---	---	---	---	---	---
Sansarc	VIe-12							
[illegible]: DeGrey	IVs-2	27	33	---	24	30	1.2	2.0
Eakin	IIc-2							
Jerauld	VIs-1							
DeD: Delmont	VIe-9	---	---	---	---	35	---	---
Do: Dorns	IIe-1	34	47	---	32	42	2.1	3.5
D[illegible]: Durrstein	VIw-4	---	---	---	---	---	---	---
EaA: Eakin	IIc-2	38	46	32	29	44	1.9	2.8
DeGrey	IVe-2							
Eg: Egas	VIw-4	---	---	---	---	---	---	---
Ev: Egas Variant	Vw-1	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Oats	Spring wheat	Winter wheat	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Bu	Tons	AUM
Fa---------- Farnsworth	IVs-2	---	42	17	23	36	2.0	3.3
GeB---------- Gettys	VIe-3	---	---	---	---	---	---	---
GeF---------- Gettys	VIIe-3	---	---	---	---	---	---	---
GhA---------- Glenham	IIc-2	39	56	26	35	47	2.1	3.5
GkB---------- Glenham---------- Java----------	 IIe-2 IIIe-12	---	49	---	30	43	2.0	3.3
HgB---------- Highmore---------- Java----------	 IIe-1 IIIe-12	44	50	---	32	46	1.9	3.2
HgC---------- Highmore---------- Java----------	 IIIe-1 IVe-3	35	47	---	25	40	1.8	3.0
HmA---------- Highmore---------- Mobridge----------	 IIc-2 IIc-3	56	63	29	39	62	2.6	4.3
HoB---------- Hurley	VIs-1	---	---	---	---	---	---	---
HsA---------- Hurley---------- Slickspots----------	 VIs-1 VIIIs-3	---	---	---	---	---	---	---
JbB---------- Java-Betts	VIe-3	---	---	---	---	---	---	---
JgC---------- Java---------- Glenham----------	 IVe-3 IIIe-2	27	41	19	23	28	1.7	2.8
Ko---------- Kolls	Vw-4	---	---	---	---	---	---	---
La---------- Lane	IIc-1	50	65	28	37	56	2.6	4.3
Lf---------- Lane---------- Farnsworth----------	 IIc-1 IVs-2	---	54	23	29	46	2.3	3.8
LoA---------- Lowry	IIc-2	43	53	---	34	42	2.0	3.3
LoB---------- Lowry	IIe-1	40	49	---	31	37	1.9	3.2
LvA---------- Lowry Variant	IIIe-2	25	38	---	30	30	1.3	2.2
LvB---------- Lowry Variant	IIIe-6	23	35	---	28	26	1.2	2.0
MaB---------- McClure	IIe-1	38	48	---	35	47	2.1	3.5
MaC---------- McClure	IIIe-2	32	43	---	29	42	1.8	3.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Oats	Spring wheat	Winter wheat	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Bu	Tons	AUM*
MbA Millboro	IIIs-3	38	55	---	40	5[illegible]	[illegible]	[illegible]
MbB Millboro	IIIe-4	36	50	---	37	48	[illegible].9	[illegible]
MbC Millboro	IVe-4	31	43	---	32	39	[illegible].6	[illegible].7
MoA Mobridge	IIc-3	60	70	33	42	67	3.0	[illegible]
Mp:		42	48	---	33	47	2.[illegible]	[illegible]
Mobridge	IIc-3							
Plankinton	IVw-1							
Oa Oahe	IIIs-2	30	44	[illegible]	25	31	[illegible].2	[illegible]
OdB:		27	35	---	22	25	[illegible]	1.8
[illegible]	IIIe-6							
Delmont	IVe-6							
OeF Okaton	VIIe-8	---	---	---	---	---	---	---
OkB [illegible]	IIIe-4	31	49	[illegible]9	33	41	[illegible]	[illegible]
OmB Opal	IIIe-4	25	45	21	3[illegible]	36	1.4	[illegible]
OmC Opal	IVe-4	24	40	[illegible]	28	36	[illegible].3	2.[illegible]
OpB Opal	VIs-5	---	---	---	---	---	---	---
Or Orthents	VIIs-2	---	---	---	---	---	---	---
OtA [illegible]	IIIe-7	22	36	19	2[illegible]	26	1.[illegible]	[illegible].8
OtB [illegible]	IIIe-8	---	33	15	28	22	1.0	[illegible].7
OwE:		---	---	---	---	---	---	---
[illegible]	VIe-6							
Schamber	VIs-4							
Pa Plankinton	IVw-1	[illegible]5	[illegible]5	---	---	15	[illegible]	[illegible]
PrA Promise	IIIs-3	33	50	---	36	45	[illegible]	[illegible].8
PrB Promise	IIIe-4	33	48	---	35	44	1.6	2.[illegible]
ReA Ree	IIc-2	39	57	25	35	48	[illegible].9	[illegible].2
ReB Ree	IIe-1	36	55	23	3[illegible]	45	[illegible].8	[illegible]
RoF:		---	---	---	---	---	---	---
Rock outcrop	VIIIs-2							
Sansarc	VIIe-8							

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE—Continued

Soil name and map symbol	Land capability	Corn	Oats	Spring wheat	Winter wheat	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Bu	Tons	AUM*
SaE:		---	---	---	---	---	---	---
Sansarc	VIe-12							
Opal	VIe-4							
SaF Sansarc-Opal	VIIe-8	---	---	---	---	---	---	---
ScE Schamber	VIs-4	---	---	---	---	---	---	---
SdF Sully	VIIe-3	---	---	---	---	---	---	---
SoC:		29	33	---	24	26	1.5	2.5
Sully	IVe-3							
Lowry	IIIe-1							
SoE:		---	---	---	---	---	---	---
Sully	VIe-3							
Lowry	IVe-3							
SsF:		---	---	---	---	---	---	---
Sully	VIe-3							
Schamber	VIs-4							
UaA Uly	IIc-2	48	60	---	36	48	2.4	4.0
UaB Uly	IIe-1	42	55	---	34	46	2.1	3.5
UaC Uly	IIIe-1	35	45	---	29	37	1.7	2.8
Wd Wendte	IIIs-3	35	55	---	35	50	1.7	2.8
We Wendte	VIw-1	---	---	---	---	---	---	---
Wo Worthing	Vw-4	---	---	---	---	---	---	---
Wp Worthing	VIIIw-1	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Ar: Artesian	Subirrigated	5,500	5,000	4,000
BeB, BeC: Beadle	Clayey	3,200	2,700	1,900
BgB*:				
Beadle	Clayey	3,200	2,700	1,900
Jerauld	Thin Claypan	1,900	1,600	1,100
BmF*:				
Betts	Thin Upland	2,500	2,100	1,500
Java	Silty	3,100	2,600	1,800
Bn: Bon	Overflow	4,200	3,800	3,000
Bo*:				
Bon, occasionally flooded	Subirrigated	4,800	4,400	3,500
Bon, rarely flooded	Overflow	4,200	3,800	3,000
Bu: Bullcreek	Dense Clay	2,000	1,700	1,200
Ca: Carter	Thin Claypan	2,300	1,900	1,100
Cp*:				
Carter	Thin Claypan	2,300	1,900	1,100
Promise	Clayey	3,300	2,800	2,000
Cr*:				
Cavo	Claypan	2,800	2,300	1,600
Jerauld	Thin Claypan	1,900	1,600	1,100
CsD*:				
Chantier	Dense Clay	2,000	1,700	1,200
Sansarc	Shallow Clay	2,500	2,100	1,500
DaA*:				
DeGrey	Claypan	2,800	2,300	1,500
Eakin	Silty	3,700	3,100	2,200
Jerauld	Thin Claypan	1,900	1,600	1,100
DeD: Delmont	Shallow to Gravel	2,300	1,900	1,100
Do: Dorna	Silty	3,100	2,600	1,800
Du: Durrstein	Saline Lowland	3,300	3,000	2,400
EaA*:				
Eakin	Silty	3,700	3,100	2,200
DeGrey	Claypan	2,800	2,300	1,500

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Eg----------------------- Egas	Saline Lowland-----------------------	3,700	3,400	2,700
Ew----------------------- Egas Variant	Wetland-----------------------	4,400	4,000	3,200
Fa----------------------- Farnsworth	Claypan-----------------------	2,400	2,000	1,200
GeF, GeP----------------- Gettys	Thin Upland-----------------------	3,100	2,600	1,800
GhA---------------------- Glenham	Silty-----------------------	3,400	2,800	2,[illegible]
GkA*:				
Glenham-----------------	Silty-----------------------	3,400	2,800	2,000
Java--------------------	Silty-----------------------	3,100	2,600	1,800
HgB*, HgC*:				
Highmore----------------	Silty-----------------------	3,700	3,100	2,600
Java--------------------	Silty-----------------------	3,100	2,600	1,800
HmA*:				
Highmore----------------	Silty-----------------------	3,700	3,100	2,700
Mobridge----------------	Overflow-----------------------	4,800	4,000	2,800
HoB---------------------- Hurley	Thin Claypan-----------------------	1,700	1,400	900
HsA*:				
Hurley------------------	Thin Claypan-----------------------	1,700	1,400	900
Slickspots.				
JhB*:				
Java--------------------	Silty-----------------------	3,100	2,600	1,800
Betts-------------------	Thin Upland-----------------------	2,800	2,300	1,600
JgC*:				
Java--------------------	Silty-----------------------	3,100	2,600	1,800
Glenham-----------------	Silty-----------------------	3,400	2,800	2,000
Ko----------------------- Kolls	Closed Depression-----------------------	3,700	3,400	2,400
La----------------------- Lane	Clayey-----------------------	3,300	2,800	2,000
Lf*:				
Lane--------------------	Clayey-----------------------	3,300	2,800	2,000
Farnsworth--------------	Claypan-----------------------	2,400	2,000	1,200
LoA, LoB----------------- Lowry	Silty-----------------------	3,100	2,600	1,800
LvA, LvB----------------- Lowry Variant	Silty-----------------------	3,100	2,400	1,900
MaB, MaC----------------- McClure	Silty-----------------------	2,800	2,300	1,600

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
MbA, MbB, MbC: Millboro	Clayey	3,100	2,600	1,800
MoA: Mobridge	Overflow	4,800	4,600	2,800
Mp*:				
Mobridge	Overflow	4,800	4,000	2,800
Plankinton	Closed Depression	3,900	3,500	2,500
[illegible]	Silty	3,100	2,600	1,800
[illegible]*:				
[illegible]	Silty	3,100	2,600	1,800
Belmont	Shallow to Gravel	2,[illegible]00	2,[illegible]00	1,300
[illegible]: [illegible]	Shallow	1,900	1,600	1,100
[illegible]	Clayey	3,[illegible]0	2,700	1,900
[illegible]	Clayey	2,900	2,400	1,700
[illegible]	Dense Clay	2,[illegible]	1,800	1,100
OtA, [illegible]	Silty	3,100	2,600	1,8[illegible]0
Ow*:				
[illegible]	Silty	3,100	2,600	1,8[illegible]
[illegible]	Very Shallow	1,400	1,200	7[illegible]0
P[illegible]	Closed Depression	3,900	3,500	2,[illegible]
PrA, [illegible]	Clayey	3,300	2,8[illegible]	[illegible]
ReA, ReB [illegible]	Silty	3,500	2,900	[illegible]
Rx*:				
Rock outcrop.				
[illegible]	Shallow Clay	2,[illegible]	2,100	1,500
Sa*, [illegible]*:				
[illegible]	Shallow Clay	2,500	2,100	1,500
[illegible]	Clayey	2,600	2,200	1,500
[illegible]	Very Shallow	1,400	1,200	7[illegible]
SdF: [illegible]	Thin Upland	2,600	2,2[illegible]0	1,500
[illegible]*, [illegible]*:				
[illegible]	Thin Upland	2,900	2,400	1,700
Lowry	Silty	3,[illegible]00	2,600	1,800

See footnote at end of table.

TABLE 7.—RANGELAND PRODUCTIVITY—Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
SaE*:				
Sully	Thin Upland	2,900	2,400	1,700
Schamber	Very Shallow	1,400	1,200	700
UaA, UaB, UaC: Uly	Silty	3,400	2,800	2,000
Wd: Wendte	Overflow	4,000	3,300	2,400
We: Wendte	Overflow	3,500	2,900	2,000
Wo: Worthing	Shallow Marsh	6,800	6,200	5,000

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Ar [illegible] Artesian	[illegible]	Tatarian [illegible], Siberian peashrub, American plum.	[illegible] pine, [illegible], [illegible], [illegible] eastern redcedar.	[illegible]	[illegible]
Be[illegible], Bd[illegible] Beadle	Skunkbush sumac, lilac.	[illegible], eastern redcedar, [illegible], [illegible], Tatarian [illegible], Siberian peashrub.	[illegible], [illegible], [illegible]	[illegible]	[illegible]
Bn[illegible]: Beadle	Skunkbush sumac, lilac.	[illegible], eastern redcedar, [illegible], [illegible], [illegible], Tatarian [illegible], Siberian peashrub.	Green ash, [illegible], honey[illegible]	[illegible]	---
Jera, [illegible]					
Bn[illegible]: Betts.					
Java.					
Bn, Bo[illegible] Bon	Lilac	Siberian peashrub, American plum, Tatarian honeysuckle.	[illegible], [illegible], [illegible], [illegible], eastern redcedar	[illegible]	[illegible]
Bu. Bullcreek					
[illegible]. Carter					
[illegible]: Carter.					
Promise	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac	[illegible] cherry, [illegible], eastern redcedar, [illegible], [illegible], Rocky Mountain juniper.	Green ash, [illegible], Siberian elm.	---	---
[illegible]: Cavo	Green ash, Russian-olive, eastern redcedar, Rocky Mountain juniper, Tatarian honeysuckle, [illegible], buffaloberry	Siberian elm, ponderosa pine.		[illegible]	[illegible]

See footnote at end of table.

TABLE 8.—WINDBREAKS AND ENVIRONMENTAL PLANTINGS—Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of— <8	8-15	16-25	26-35	>35
Cp*: [illegible].					
Cp*: [illegible]lantier.					
[illegible].					
[illegible]A*: [illegible]roy	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
[illegible]	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Jerauld					
DeD: [illegible]	Lilac, Peking cotoneaster.	Bur oak, eastern redcedar, Rocky Mountain juniper, ponderosa pine, Manchurian crabapple, Siberian peashrub.	Siberian elm, honeylocust, green ash, Russian-olive.	---	---
Do: Dorna	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Du. D[illegible]stein					
EaA*: Eakin	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
DeGrey	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
Eg: [illegible]					
Fm: [illegible]					
Fa: Farnsworth	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
GeE, GeF: Gettys.					
GhA: Glenham	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, Russian-olive, honeylocust, bur oak, hackberry.	Siberian elm	---
GkB*: Glenham	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, Russian-olive, honeylocust, bur oak, hackberry.	Siberian elm	---
Java	Silver buffaloberry, eastern redcedar, Siberian peashrub, Tatarian honeysuckle, Peking cotoneaster, lilac, skunkbush sumac.	Ponderosa pine, Russian-olive, green ash, Rocky Mountain juniper.	Siberian elm	---	---
HgB*, HgC*: Highmore	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Java	Silver buffaloberry, eastern redcedar, Siberian peashrub, Tatarian honeysuckle, Peking cotoneaster, lilac, skunkbush sumac.	Ponderosa pine, Russian-olive, green ash, Rocky Mountain juniper.	Siberian elm	---	---
HmA*: Highmore	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Mobridge	Lilac	Tatarian honeysuckle, Siberian peashrub, American plum.	Ponderosa pine, [illegible], green ash, hackberry, Russian mulberry, eastern redcedar.	Honeylocust	Eastern cottonwood.
HoB. Hurley					
HsA*: Hurley.					
Slickspots.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
JbE*: Java. Betts.					
JgC*: Java	Silver buffaloberry, eastern redcedar, Siberian peashrub, Tatarian honeysuckle, Peking cotoneaster, lilac, skunkbush sumac.	Ponderosa pine, Russian-olive, green ash, Rocky Mountain juniper.	Siberian elm	---	---
Glenham	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Ko. Kolls					
Le Lane	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Lf*: Lane	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
Farnsworth	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, lilac.	Siberian elm, green ash, ponderosa pine, Russian-olive.	---	---	---
LoA, LoB Lowry	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---
LvA, LvB Lowry Variant	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry.	Honeylocust, green ash, hackberry, ponderosa pine, Russian-olive, bur oak.	Siberian elm	---
MaA, MaC McClure	Tatarian honeysuckle, lilac.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, bur oak, hackberry, Russian-olive, green ash, honeylocust.	Siberian elm	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
MbA, MbB, MbC: [illegible]	Siberian peashrub, Tatarian honeysuckle, lilac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, Manchurian crabapple.	Siberian elm, honeylocust, green ash, hackberry.	---	---
MoA: Mobridge	Lilac	Tatarian honeysuckle, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, green ash, hackberry, Russian mulberry, eastern redcedar.	Honeylocust	Eastern cottonwood.
Mp*: Mobridge	Lilac	Tatarian honeysuckle, Siberian peashrub, American plum.	Ponderosa pine, blue spruce, green ash, hackberry, Russian mulberry, eastern redcedar.	Honeylocust	Eastern cottonwood.
Plankinton.					
Oa: Oahe	---	Ponderosa pine, green ash, Siberian peashrub, Rocky Mountain juniper, Russian-olive, eastern redcedar.	Siberian elm	---	---
OdB*: Oahe	---	Ponderosa pine, green ash, Siberian peashrub, Rocky Mountain juniper, Russian-olive, eastern redcedar.	Siberian elm	---	---
Delmont	Lilac, Peking cotoneaster.	Bur oak, eastern redcedar, Rocky Mountain juniper, ponderosa pine, Manchurian crabapple, Siberian peashrub.	Siberian elm, honeylocust, green ash, Russian-olive.	---	---
Oe*. Okaton					
OkB: Oko	Common chokecherry, American plum, silver buffaloberry, Peking cotoneaster, lilac.	Hackberry, Russian-olive, eastern redcedar, Siberian crabapple.	Green ash, ponderosa pine, Siberian elm.	---	---
[illegible]	Tatarian honeysuckle, [illegible]	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, honeylocust, Siberian elm.	---	---
[illegible]					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Or. Orthents					
OtA, OtB Orton	Siberian peashrub, Peking cotoneaster, lilac.	Ponderosa pine, Manchurian crabapple, Russian-olive, eastern redcedar, hackberry, Rocky Mountain juniper.	Siberian elm, green ash, honeylocust.	---	---
OwE*: Orton	Siberian peashrub, Peking cotoneaster, lilac.	Ponderosa pine, Manchurian crabapple, Russian-olive, eastern redcedar, hackberry, Rocky Mountain juniper.	Siberian elm, green ash, honeylocust.	---	---
Schamber.					
Pa. Plankinton					
PrA, PrB Promise	Tatarian honeysuckle, Siberian peashrub, skunkbush sumac, lilac.	Hackberry, Russian-olive, eastern redcedar, Manchurian crabapple, Rocky Mountain juniper.	Green ash, honeylocust, Siberian elm.	---	---
ReA, ReB Ree	Lilac, Tatarian honeysuckle.	Eastern redcedar, Siberian peashrub, common chokecherry.	Ponderosa pine, honeylocust, green ash, Russian-olive, bur oak, hackberry.	Siberian elm	---
RsF*: Rock outcrop.					
Sansarc.					
SaE*, SaF*: Sansarc.					
Opal.					
ScE. Schamber					
SdF. Sully					
SeC*: Sully	Siberian peashrub, skunkbush sumac, silver buffaloberry, lilac.	Ponderosa pine, Russian-olive, Rocky Mountain juniper, eastern redcedar.	Siberian elm, green ash, honeylocust.	---	---
Lowry	Tatarian honeysuckle, lilac.	Eastern redcedar, common chokecherry, Siberian peashrub.	Ponderosa pine, green ash, hackberry, Russian-olive, honeylocust, bur oak.	Siberian elm	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
SoE*: [illegible]					
[illegible]-----------	Tatarian honeysuckle, lilac.	eastern redcedar, [illegible], [illegible] cherry, [illegible], [illegible].	Ponderosa pine, green ash, [illegible], [illegible], [illegible], [illegible].	Siberian elm------	
SxE*: [illegible].					
Schamber.					
[illegible]----------	Tatarian honeysuckle, lilac.	[illegible], [illegible] cherry, [illegible], [illegible], eastern redcedar.	Hackberry, [illegible], [illegible], green ash, [illegible], ponderosa pine.	Siberian elm------	---
Wt, We-------- [illegible]	Tatarian honeysuckle, [illegible], [illegible], [illegible] sumac, lilac.	Hackberry, [illegible], eastern redcedar, [illegible], [illegible], Rocky Mountain juniper.	green ash, [illegible], [illegible].	---	---
Wx, Wz. Worthing					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ar: Artesian	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
[illegible]	Slight	Slight	Moderate: slope.	Slight.
[illegible]	Slight	Slight	Severe: slope.	Slight.
[illegible]*: [illegible]	Slight	Slight	Moderate: slope.	Slight.
[illegible]	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.
[illegible]*: [illegible]	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[illegible]	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
[illegible]	Severe: flooding.	Slight	Slight	Slight.
[illegible]*: [illegible]	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight.
[illegible], rarely flooded	Severe: flooding.	Slight	Slight	Slight.
[illegible]	Severe: percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.
[illegible]	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
[illegible]*: [illegible]	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight.
[illegible]	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
[illegible]*: [illegible]	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
[illegible]	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.
CeD*: [illegible]	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
[illegible]	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
DaA*:				
DeGrey	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Eakin	Slight	Slight	Slight	Slight.
Jerauld	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.
DeF: Delmont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Do: Doran	Slight	Slight	Slight	Slight.
Du: Durrstein	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess sodium, excess salt.	Severe: wetness, percs slowly.	Severe: wetness.
EaA*:				
Eakin	Slight	Slight	Slight	Slight.
DeGrey	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Eg: Egas	Severe: wetness, flooding.	Severe: wetness, excess salt.	Severe: wetness.	Severe: wetness.
Ex: Egas Variant	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Fa: Farmsworth	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
GeE: Gettys	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
GeF: Gettys	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GlA: Glenham	Slight	Slight	Slight	Slight.
GkB*:				
Glenham	Slight	Slight	Moderate: slope.	Slight.
Java	Slight	Slight	Moderate: slope.	Slight.
HgB*:				
Highmore	Slight	Slight	Moderate: slope.	Slight.
Java	Slight	Slight	Moderate: slope.	Slight.
HgC*:				
Highmore	Slight	Slight	Moderate: slope.	Slight.
Java	Slight	Slight	Severe: slope.	Slight.

See footnote at end of table.

TABLE 9.—RECREATIONAL DEVELOPMENT—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
HmA*: Highmore	Slight	Slight	Moderate: slope.	Slight.
Mobridge	Severe: flooding.	Slight	Moderate: flooding.	Slight.
HoB: Hurley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
HsA*: Hurley	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Slickspots.				
JbE*: Java	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Betts	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
JgC*: Java	Slight	Slight	Severe: slope.	Slight.
Glenham	Slight	Slight	Severe: slope.	Slight.
Ko: Kolls	Severe: ponding, percs slowly, too clayey.	Severe: too clayey, ponding, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: too clayey, ponding.
La: Lane	Severe: flooding.	Slight	Slight	Slight.
Lf*: Lane	Severe: flooding.	Slight	Slight	Slight.
Farnsworth	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
LoA: Lowry	Slight	Slight	Slight	Slight.
LoB: Lowry	Slight	Slight	Moderate: slope.	Slight.
LvA: Lowry Variant	Slight	Slight	Slight	Slight.
LvB: Lowry Variant	Slight	Slight	Moderate: slope.	Slight.
MaB: McClure	Slight	Slight	Moderate: slope.	Slight.
MaC: McClure	Slight	Slight	Severe: slope.	Slight.
MbA: Millboro	Slight	Slight	Slight	Moderate: too clayey.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
[illegible]	Slight	Slight	Moderate: slope.	Moderate: too clayey.
[illegible]	Slight	Slight	Severe: slope.	Moderate: too clayey.
[illegible]	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Mp*: [illegible]	Severe: flooding.	Slight	Moderate: flooding.	Slight.
[illegible]	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
[illegible]	Slight	Slight	Moderate: small stones.	Slight.
[illegible]	Slight	Slight	Moderate: slope, small stones.	Slight.
[illegible]	Slight	Slight	Moderate: slope.	Slight.
[illegible]	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope, erodes easily.
[illegible]	Slight	Slight	Moderate: slope.	Slight.
[illegible]	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, depth to rock.	Moderate: too clayey.
[illegible]	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
[illegible]	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, depth to rock.	Moderate: too clayey.
[illegible]: [illegible]				
[illegible]	Slight	Slight	Moderate: small stones.	Slight.
[illegible]	Slight	Slight	Moderate: slope, small stones.	Slight.
[illegible]	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
[illegible]	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

* See [illegible]

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Fr: Frankinton	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
PrA: Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
PrB: Promise	Moderate: percs slowly.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
ReA: Ree	Slight	Slight	Slight	Slight.
ReB: Ree	Slight	Slight	Moderate: slope.	Slight.
RsF*: Rock outcrop.				
Samsara	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
SaF*: Samsara	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
Opal	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
SaF*: Samsara	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Opal	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
ScE: Schamber	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
SdF: Sully	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
SoC*: Sully	Slight	Slight	Severe: slope.	Slight.
Lowry	Slight	Slight	Severe: slope.	Slight.
SoE*: Sully	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Lowry	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
SpE*: Sully	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
SeF*: Schamber	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
[illegible] [illegible]	Slight	Slight	[illegible]	[illegible]
[illegible] [illegible]	Slight	Slight	Moderate: slope.	[illegible]
[illegible] [illegible]	Slight	Slight	Moderate: slope.	Slight.
Wt: [illegible]	Severe: [illegible].	Moderate: too clayey.	Moderate: [illegible].	Moderate: too clayey.
Wo: [illegible]	Severe: [illegible].	Slight	[illegible]	[illegible]
Wo, Wp: Worthing	Severe: [illegible].	Severe: [illegible].	[illegible]	[illegible]

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas
Ar: Artesian	Fair	Good	Fair	Good	Very poor	Poor	Poor.
BeB: Beadle	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
[illegible]: Beadle	Poor	Fair	Good	Fair	Very poor	Very poor	Very poor.
[illegible]*:							
Beni[illegible]	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
Jerauld	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]*:							
[illegible]	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
Java	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor.
[illegible]: Bon	Good	Good	Fair	Good	Very poor	Very poor	Very poor.
Bo*:							
Bon, occasionally flooded	Fair	Good	Fair	Good	Very poor	Very poor	Very poor.
Bon, rarely flooded	Good	Good	Fair	Good	Very poor	Very poor	Very poor.
[illegible]: [illegible] Creek	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]: Carter	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]*:							
Carter	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
Promise	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
[illegible]*:							
Cavo	Poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
Jerauld	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
CbD*:							
[illegible]	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
Sansarc	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
DaA*:							
[illegible]	Poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]	Good	Good	Good	Good	Very poor	Very poor	Very poor.
Jerauld	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]: Delmont	Very poor	Fair	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]: Dorna	Good	Good	Good	Good	Very poor	Very poor	Very poor.
[illegible]: Durrstein	Very poor	Poor	Fair	Poor	Very poor	Fair	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas
EkA*:							
Eakin	Good	Good	Good	Good	Very poor	Very poor	Very poor.
DeGrey	Poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
Eg: Egas	Very poor	Very poor	Fair	Poor	Very poor	Poor	Poor.
Ew: Egas Variant	Very poor	Very poor	Fair	Poor	Very poor	Fair	Fair.
Fa: Farnsworth	Poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
GeE: Gettys	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor.
GeF: Gettys	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
GhA: Glenham	Good	Good	Good	Good	Very poor	Very poor	Very poor.
GwB*:							
Glenham	Good	Good	Good	Good	Very poor	Very poor	Very poor.
Java	Fair	Fair	Good	Poor	Very poor	Very poor	Very poor.
HgB*:							
Highmore	Good	Good	Good	Good	Very poor	Very poor	Very poor.
Java	Fair	Fair	Good	Poor	Very poor	Very poor	Very poor.
HgC*:							
Highmore	Fair	Good	Good	Good	Very poor	Very poor	Very poor.
Java	Poor	Fair	Good	Poor	Very poor	Very poor	Very poor.
HmA*:							
Highmore	Good	Good	Good	Good	Very poor	Very poor	Very poor.
Mobridge	Good	Good	Fair	Good	Very poor	Very poor	Very poor.
HoB: Hurley	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
HsA*:							
Hurley	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
Slickspots.							
JbE*:							
Java	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor.
Betts	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor.
JgC*:							
Java	Poor	Fair	Good	Poor	Very poor	Very poor	Very poor.
Glenham	Fair	Good	Good	Fair	Very poor	Very poor	Very poor.
Ko: Kolls	Very poor	Poor	Poor	Poor	Very poor	Fair	Fair.
La: Lane	Good	Fair	Good	Good	Very poor	Very poor	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas
Lf*:							
Lane	Good	Fair	Good	Good	Very poor	Very poor	Very poor.
Farnsworth	Poor	Poor	Poor	Poor	Very poor	Very poor	Very poor.
LoA, LoB Lowry	Good	Good	Good	Good	Very poor	Very poor	Very poor.
LvA, LvB Lowry Variant	Fair	Fair	Good	Poor	Very poor	Very poor	Very poor.
McB McClure	Good	Good	Good	Good	Very poor	Very poor	Very poor.
McC McClure	Fair	Good	Good	Good	Very poor	Very poor	Very poor.
MbA, MbB Millboro	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
MbC Millboro	Poor	Fair	Good	Fair	Very poor	Very poor	Very poor.
MoA Mobridge	Good	Good	Fair	Good	Very poor	Very poor	Very poor.
Mp*:							
Mobridge	Good	Good	Fair	Good	Very poor	Very poor	Very poor.
Plankinton	Poor	Poor	Poor	Fair	Very poor	Poor	Fair.
OA Oahe	Fair	Fair	Good	Poor	Very poor	Very poor	Very poor.
OdB*:							
Oahe	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
Delmont	Poor	Fair	Poor	Fair	Very poor	Very poor	Very poor.
OeF Okaton	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
OgB Oko	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
OmB Opal	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
OmC Opal	Poor	Fair	Good	Fair	Very poor	Very poor	Very poor.
OpE Opal	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
Or. Orthents							
OtA, OtB Orton	Fair	Fair	Good	Poor	Very poor	Very poor	Very poor.
Ow*:							
Orton	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor.
Schamber	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
Pa Plankinton	Poor	Poor	Poor	Poor	Very poor	Poor	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas
[illegible]--------------- Promise	Fair	Fair	Good	Fair	Very poor	Very poor	Very poor.
[illegible]--------- Ree	Good	Good	Good	Good	Very poor	Very poor	Very poor.
RsF*. Rock outcrop.							
Sansarc----------------	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
SaE*: Sansarc----------------	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
[illegible]---------------	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor.
SaF*: Sansarc----------------	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
[illegible]---------------	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor.
[illegible]--------------- [illegible]	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]--------------- [illegible]	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor.
[illegible]*: [illegible]y---------------	Poor	Fair	Fair	Poor	Very poor	Very poor	Very poor.
Lowry---------------	Fair	Good	Good	Fair	Very poor	Very poor	Very poor.
[illegible]*: [illegible]---------------	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor.
[illegible]wry---------------	Poor	Good	Good	Fair	Very poor	Very poor	Very poor.
[illegible]*: [illegible]---------------	Very poor	Fair	Fair	Poor	Very poor	Very poor	Very poor.
[illegible]hamber---------------	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor.
[illegible]--------------- [illegible]	Good	Good	Good	Good	Very poor	Very poor	Very poor.
[illegible]--------------- [illegible]	Fair	Good	Good	Fair	Very poor	Very poor	Very poor.
[illegible]--------------- Wendte	Fair	Fair	Fair	Fair	Poor	Very poor	Very poor.
[illegible]--------------- Wendte	Poor	Fair	Fair	Fair	Very poor	Very poor	Very poor.
W[illegible]--------------- Worthing	Very poor	Poor	Fair	Poor	Very poor	Good	Good.
Wp--------------- Worthing	Very poor	Very poor	Very poor	Poor	Very poor	Good	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ar----------------- Artesian	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
BeB, BeC----------- Beadle	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
[illegible]*: Beadle--------------	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Jerauld------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
BmF*: Betts--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Java---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Bn----------------- Bon	Slight------------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Bo*: Bon, occasionally flooded----------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.
Bon, rarely flooded----------	Slight------------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.
Bu----------------- Bullcreek	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Ca----------------- Carter	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cp*: Carter-------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Promise------------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cr*: Cavo---------------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE [illegible].--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cd*:					
[illegible]eraud	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cn*:					
Chantier	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Sansarc	Severe: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
DnA*:					
[illegible]	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Eakin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Geraud	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
[illegible]:					
[illegible]	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
[illegible]:					
[illegible]	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
[illegible]:					
[illegible]rstein	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: [illegible] wetness.	Severe: [illegible] wetness.	Severe: [illegible] wetness.
EaA*:					
Eakin	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Delrey	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Eg:					
Egas	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: [illegible] wetness, shrink-swell.	Severe: [illegible] wetness, shrink-swell.	Severe: low strength, wetness, [illegible].
Ew:					
Egas Variant	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: [illegible] shrink-swell.	Severe: [illegible] shrink-swell.	Severe: [illegible]
Fa:					
Farnsworth	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: [illegible] shrink-swell.	Severe: flooding, shrink-swell.	Severe: [illegible] shrink-swell.
GeE, GeF:					
Gettys	Severe: slope.	Severe: shrink-swell, slope.	Severe: [illegible] shrink-swell.	Severe: [illegible] slope.	Severe: [illegible]
GlA:					
Glenham	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 11.—BUILDING SITE DEVELOPMENT—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
GkB*:					
Glenham	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Java	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
HgB*:					
Highmore	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Java	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
HgC*:					
Highmore	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Java	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
HmA*:					
Highmore	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
Mobridge	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Ho: Hurley	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
HsA*:					
Hurley	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Slickspots.					
JtE*:					
Java	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Betts	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
JgC*:					
Java	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Glenham	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Ko: Kolls	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: low strength, ponding, shrink-swell.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
La----------------- Lane	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
Lf*: Lane--------------	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
Farnsworth--------	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
LoA---------------- Lowry	Slight-----------	Slight-----------	Slight-----------	Slight-----------	Moderate: frost action, low strength.
LoB---------------- Lowry	Slight-----------	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action, low strength.
LvA---------------- Lowry Variant	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight-----------	Moderate: frost action.
LvB---------------- Lowry Variant	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Moderate: frost action.
MaA, MaB----------- McClure	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
MbA, MbB, MbC------ Millboro	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
McA---------------- Mobridge	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Mp*: Mobridge----------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Plankinton---------	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.
Oa----------------- Oahe	Severe: cutbanks cave.	Slight-----------	Slight-----------	Slight-----------	Slight.
OdB*: Oahe--------------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
Delmont-----------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight.
OeF*--------------- Okaton	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.
[illegible]---------------- [illegible]	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
OmB: Opal	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
OmC: Opal	Moderate: too clayey, depth to rock, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
OpB: Opal	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Or. Orthents					
OtA: Orton	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
OtB: Orton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
OwE*:					
Orton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Schamber	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pe: Plankinton	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.
PrA, PrB: Promise	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
ReA: Ree	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
ReB: Ree	Slight	Moderate: shrink-swell.	Slight	Moderate: slope, shrink-swell.	Severe: low strength.
RsF*:					
Rock outcrop.					
Sansarc	Severe: slope, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
SaE*, SaF*:					
Sansarc	Severe: slope, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
Opal	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength.
ScF: Schamber	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE [illegible].--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
[illegible]	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[illegible]	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.
[illegible]	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action, low strength.
[illegible]	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[illegible]	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.
[illegible]	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.
[illegible]	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[illegible]	Slight	Slight	Slight	Slight	Moderate: low strength.
[illegible]	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.
[illegible]	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.
[illegible]	Moderate: flooding, too clayey.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, flooding.	Severe: shrink-swell, low strength, flooding.
[illegible]	Severe: ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: low strength, ponding, frost action.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ar: Artesian	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
BeB: Beadle	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BeC: Beadle	Severe: percs slowly.	Severe: slope.	Severe: too clayey	Slight	Poor: too clayey, hard to pack.
BgB*:					
Beadle	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	Poor: too clayey, hard to pack, excess sodium.
BmF*:					
Betts	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Java	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Bn: Bon	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Good.
Bo*:					
Bon, occasionally flooded	Severe: flooding, wetness.	Severe: seepage, flooding, wetness	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
Bon, rarely flooded	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Good.
Bu: Bullcreek	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Ca: Carter	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Cp*:					
Carter	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Promise	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	[illegible]	[illegible]	[illegible]
Ce*:					
Cavo	Severe: percs slowly.	Slight	Severe: [illegible]	Slight	[illegible]
Jerauld	Severe: percs slowly.	Slight	Severe: too clayey, excess sodium.	Slight	[illegible]
CeD*:					
[illegible]	[illegible] depth to rock.	[illegible] depth to rock, slope.	[illegible] depth to rock.	[illegible] depth to rock.	[illegible]
[illegible]	[illegible] depth to rock.	[illegible] slope, depth to rock.	[illegible] depth to rock.	[illegible] depth to rock.	[illegible]
DeA*:					
DeGrey	Severe: percs slowly.	Slight	Severe: [illegible]	Slight	[illegible]
Eakin	Severe: percs slowly.	[illegible]	[illegible]	[illegible]	[illegible]
Jerauld	Severe: percs slowly.	[illegible]	[illegible]	[illegible]	[illegible]
DeD Delmont	Severe: poor filter.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]:					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Egas	[illegible] wetness [illegible]	[illegible] wetness	[illegible]	[illegible]	[illegible]
[illegible] Egas Variant	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fa Farnsworth	Severe: percs slowly, wetness.	[illegible] wetness	[illegible]	[illegible]	[illegible]

See footnote at end of table.

TABLE [illegible].--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[illegible]*: [illegible]	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
[illegible]: [illegible]	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
[illegible]*: [illegible]	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Java	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Hy[illegible]*: Highmore	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Java	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
H[illegible]*: Highmore	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Java	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
H[illegible]*: Highmore	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
M[illegible]ridge	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
HoB: Hurley	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, excess sodium, too clayey.	Severe: depth to rock.	Poor: area reclaim, hard to pack, excess sodium.
H[illegible]*: Hurley	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, excess sodium, too clayey.	Severe: depth to rock.	Poor: area reclaim, hard to pack, excess sodium.
[illegible] map to					
J[illegible]*: [illegible]	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Betts	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
JgC*: Java	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Jg*: Glenham	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ko: Kolls	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, wetness, hard to pack.
La: Lane	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
Lf*: Lane	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
Farmsworth	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey, wetness, excess sodium.	Severe: wetness.	Poor: too clayey, hard to pack, excess sodium.
LoA: Lowry	Slight	Moderate: seepage.	Slight	Slight	Good.
LoB: Lowry	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
LvA, LvB: Lowry Variant	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
McB: McClure	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
McC: McClure	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MbA: Millboro	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MbB: Millboro	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MbC: Millboro	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MoA: Mobridge	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Mp*: Mobridge	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Plankinton	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Oa: Oahe	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
OdB*: Oahe	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Delmont	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage, too sandy.
OeF: Okaton	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, hard to pack, slope.
OkB: Oko	Severe: percs slowly.	Moderate: slope.	Severe: too clayey	Slight	Poor: too clayey, hard to pack.
OmB: Opal	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
OmC: Opal	Severe: percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
OpB: Opal	Severe: depth to rock	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Or. Orthents					
OtA, OtB: Orton	Severe: poor filter	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
OwE*: Orton	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Schamber	Severe: slope, poor filter.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: small stones, seepage, too sandy
PaA: Plankinton	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding	Poor: too clayey, hard to pack, ponding.
PrA: Promise	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[illegible]: Promise	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
[illegible]: Roe	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
[illegible]: Roe	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
[illegible]*: Rock outcrop					
Sansarc	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, hard to pack.
[illegible]*, [illegible]*: Sansarc	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, hard to pack.
Opal	Severe: slope, percs slowly, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, hard to pack.
[illegible]*: Schamber	Severe: slope, poor filter.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: small stones, seepage, too sandy.
SdF: Sully	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
[illegible]*: Sully	Slight	Severe: slope.	Slight	Slight	Good.
Lowry	Slight	Severe: slope.	Slight	Slight	Good.
[illegible]*: Sully	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lowry	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
[illegible]*: Sully	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Schamber	Severe: slope, poor filter.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: small stones, slope, too sandy.
JaA: [illegible]	Slight	Moderate: seepage.	Slight	Slight	Good.
JaB: [illegible]	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ja* ly	Slight	Severe: slope	Slight	Slight	Good.
Wd Wendte	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
We Wendte	Severe: percs slowly, flooding.	Severe: flooding.	Severe: too clayey, flooding.	Severe: flooding.	Poor: too clayey, hard to pack.
Wo Worthing	Severe: percs slowly, ponding.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Wp Worthing	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ar----------------------- Artesian	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BaB, BaC----------------- Beadle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Bc*: Beadle------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Jerauld-----------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
BmF*: Betts-------------------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
[illegible]-------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Bo------------------------ Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bp*: Bon, occasionally flooded----------------	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bon, rarely flooded-	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bu------------------------ Bullcreek	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ch------------------------ Carter	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Cp*: Carter------------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Promise-----------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Cr*: Cavo--------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Jerauld-----------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines	Poor: excess sodium.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CaB*: Chantier	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey.
Sansarc	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim.
DaA*: DeGrey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Eakin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Jerauld	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
[illegible]: Delmont	Good	Probable	Probable	Poor: small stones, area reclaim.
[illegible]: [illegible]orna	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
[illegible]: Durrstein	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness, excess sodium.
EaA*: Eakin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
DeGrey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Eg: Egas	Poor: shrink-swell, wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Ew: Egas Variant	Poor: shrink-swell, wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Fa: Farmsworth	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
GeE: Gettys	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GeF: Gettys	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GhA: Glenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
GhB*: Glenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GkB*: Java	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HgB*, HgC*: Highmore	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Java	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HmA*: Highmore	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Mobridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HoB: Hurley	Poor: shrink-swell, low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
HnA*: Hurley	Poor: shrink-swell, low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Slickspots.				
JkE*: Java	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Betts	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
JgC*: Java	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Glenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ko: Kolls	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
La: Lane	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lf*: Lane	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Farnsworth	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
LoA, LoB: Lowry	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.—CONSTRUCTION MATERIALS—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LvA, LvB: Lowry Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
MaB, MaC: McClure	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MbA, MbB, MbC: Millboro	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MoA: Mobridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Mp*:				
Mobridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Plankinton	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Oa: Oahe	Good	Probable	Probable	Poor: small stones, area reclaim.
OdB*:				
Oahe	Good	Probable	Probable	Poor: small stones, area reclaim.
Delmont	Good	Probable	Probable	Poor: small stones, area reclaim.
OeF: Okaton	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, slope.
OkB: Oko	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
OmB, OmC: Opal	Poor: shrink-swell, low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
OpE: Opal	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Or. Orthents				
OtA, OtB: Orton	Good	Probable	Probable	Poor: small stones, area reclaim.
OwE*:				
Orton	Good	Probable	Probable	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 1[illegible].--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
[illegible]*:				
Schamber	Fair: slope.	Probable	Probable	Poor: slope, small stones, area reclaim.
P[illegible]: Plankinton	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
PrA, PrB: Promise	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
PsA, PsB: Ree	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RsF*:				
Rock outcrop.				
Sansarc	Poor: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, area reclaim.
SaE*:				
Sansarc	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, area reclaim.
Opal	Poor: shrink-swell, low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
SbE*:				
Sansarc	Poor: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, area reclaim.
Opal	Poor: shrink-swell, low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
[illegible]: Schamber	Fair: slope.	Probable	Probable	Poor: slope, small stones, area reclaim.
[illegible]: Sully	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
[illegible]*:				
Sully	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lowry	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
SoE*:				
Sully	Fair: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SoF*:				
Lowry	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
SaF*:				
Sully	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Schamber	Fair: slope.	Probable	Probable	Poor: slope, small stones, area reclaim.
UmA, UmB, UmC: Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wd: Wendte	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
We: Wendte	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Wo, Wp: Worthing	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--WATER MANAGEMENT

Some terms that describe restrictive soil features are [illegible] "slight," "moderate," and "severe." [illegible] the soil [illegible] this table indicates [illegible] investigation

Soil name and map symbol	Limitations for--: Pond reservoir areas	Limitations for--: Embankments, dikes, and levees	Features affecting--: Drainage	Features affecting--: Irrigation	Features affecting--: Terraces and diversions	Features affecting--: Grassed waterways
Ar: Artesian	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	[illegible]	[illegible], easily, [illegible] slowly.
BeB, BeC: Beadle	Moderate: [illegible]	Moderate: hard to pack.	Deep to water	[illegible]	[illegible]	[illegible]
Bg*: Beadle	Moderate: [illegible]	Moderate: hard to pack.	Deep to water	[illegible]	[illegible]	[illegible]
Jerauld	Slight	Severe: hard to pack, [illegible]	Deep to water	[illegible]	Percs slowly, erodes easily.	[illegible]
Bm*: Betts	Severe: slope.	Slight	Deep to water	[illegible]	Slope, erodes easily.	Slope, erodes easily.
Java	Severe: slope.	Slight	Deep to water	[illegible]	Slope, erodes easily.	[illegible]
Bn: Bon	Moderate: seepage.	Severe: [illegible]	Deep to water	[illegible]	Favorable	Favorable.
Bo*: Bon, occasionally flooded	Moderate: seepage.	Severe: [illegible]	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable
Bon, rarely flooded	Moderate: seepage.	Severe: [illegible]	Deep to water	Favorable	Favorable	Favorable.
Bu: Bullcreek	Slight	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
Ca: Carter	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Percs slowly, erodes easily.	[illegible]
Cp*: Carter	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	[illegible]	[illegible]
Promise	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	[illegible]	[illegible]
Cr*: Cavo	Slight	Severe: excess sodium.	Deep to water	Droughty, percs slowly.	Percs slowly	Excess sodium, droughty, percs slowly.
Jerauld	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, droughty, erodes easily.
Cs*: Chantier	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Sansarc	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, [illegible] percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
DeE*:						
Dupree	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily, percs slowly.
Eakin	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
Jerauld	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Percs slowly, erodes easily.	Excess sodium, droughty, erodes easily.
[illegible]	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Droughty, slope.
[illegible]	Moderate: seepage.	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
[illegible]	Slight	Severe: hard to pack, wetness, excess sodium.	Ponding, percs slowly, excess salt.	Wetness, excess sodium, percs slowly.	Wetness, percs slowly, erodes easily.	Excess sodium, excess salt, wetness.
DkA*:						
Eakin	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
Dupree	Slight	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium.	Erodes easily	Excess sodium, erodes easily, percs slowly.
Eg: Egas	Slight	Severe: hard to pack, wetness, excess salt.	Percs slowly, ponding, frost action.	Wetness, excess salt.	Wetness, percs slowly.	Excess salt, wetness, percs slowly.
Ew: Egas Variant	Slight	Severe: hard to pack, ponding, excess salt.	Percs slowly, ponding, frost action.	Ponding, excess salt.	Ponding, percs slowly.	Excess salt, wetness, percs slowly.
Fa: Farnsworth	Slight	Severe: hard to pack, excess salt.	Deep to water	Percs slowly, excess sodium, erodes easily.	Percs slowly, erodes easily.	Excess sodium, erodes easily, percs slowly.
GeF, GeE*: Gettys	Severe: slope.	Severe: hard to pack	Deep to water	Slope	Slope	Slope.
Gh*: Glenham	Slight	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
GlB*:						
Glenham	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Java	Moderate: seepage, slope.	Slight	Deep to water	Slope, excess salt.	Erodes easily	Erodes easily.
HgB*, HgC*:						
Highmore	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Java	Moderate: seepage, slope.	Slight	Deep to water	Slope, excess salt.	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HmA*: Highmore	Moderate: slope, seepage.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Mobridge	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
HoB: Hurley	Moderate: depth to rock.	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium, depth to rock.	Depth to rock, erodes easily.	Excess sodium, erodes easily.
HsA*: Hurley	Moderate: depth to rock.	Severe: hard to pack, excess sodium.	Deep to water	Percs slowly, excess sodium, depth to rock.	Depth to rock, erodes easily.	Excess sodium, erodes easily.
Slickspots.						
JbF*: Java	Severe: slope.	Slight	Deep to water	Slope, excess salt.	Slope, erodes easily.	Slope, erodes easily.
Betts	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
JgC*: Java	Moderate: seepage, slope.	Slight	Deep to water	Slope, excess salt.	Erodes easily	Erodes easily.
Glenham	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
Ko: Kolls	Slight	Severe: hard to pack, ponding.	Percs slowly, ponding.	Slow intake, ponding.	Ponding, erodes easily, percs slowly.	Wetness, erodes easily.
La: Lane	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Lf*: Lane	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly	Erodes easily, percs slowly.
Farnsworth	Slight	Severe: hard to pack, excess salt.	Deep to water	Percs slowly, excess sodium, erodes easily.	Percs slowly, erodes easily.	Excess sodium, erodes easily, percs slowly.
LoA: Lowry	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
LoB: Lowry	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
LvA: Lowry Variant	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Favorable	Favorable.
LvB: Lowry Variant	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope	Favorable	Favorable.
MaB, MaC: McClure	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Percs slowly	Percs slowly.
MbA: Millboro	Slight	Severe: hard to pack	Deep to water	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
MbB, MbC: Millboro	Moderate: slope.	Severe: hard to pack	Deep to water	Slope, percs slowly, erodes easily	Percs slowly, erodes easily.	Erodes easily, percs slowly.
MoA: Mobridge	Moderate: seepage.	Moderate: piping	Deep to water	Flooding	Erodes easily	Erodes easily.
Mp*: Mobridge	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
Plankinton	Slight	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
OaB: Oahe	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
OdE*: Oahe	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Too sandy	Favorable.
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy	Droughty.
OeF: Okaton	Severe: depth to rock, slope.	Severe: hard to pack	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Large stones, slope, erodes easily.
OkB: Oko	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly
OmB: Opal	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Depth to rock, erodes easily.	Erodes easily.
OmC: Opal	Severe: slope.	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
OpB: Opal	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Droughty, slow intake, percs slowly.	Depth to rock, erodes easily, percs slowly.	Erodes easily, droughty, depth to rock.
Or. Orthents						
OtA: Orton	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
OtB: Orton	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy	Droughty.
OwE*: Orton	Severe: seepage, slope	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty.
Schamber	Severe: slope, seepage	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy	Slope, droughty.
Pa: Plankinton	Slight	Severe: ponding.	Ponding, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
PrA: Promise	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	Percs slowly, erodes easily.	Erodes easily, droughty.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
PrB: Promise	Moderate slope.	Severe hard to pack.	Deep to water	Slow intake, percs slowly, droughty.	Percs slowly, erodes easily.	Erodes easily, droughty.
[illegible]: [illegible]	Moderate seepage.	Moderate piping.	Deep to water	Favorable	Favorable	Favorable.
[illegible]: [illegible]	Moderate seepage, slope.	Moderate piping.	Deep to water	Slope	Favorable	Favorable.
[illegible]*: Rock outcrop.						
Sansarc	Severe depth to rock, slope.	Severe hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, erodes easily.
[illegible]*, [illegible]*: Sansarc	Severe depth to rock, slope.	Severe hard to pack.	Deep to water	Slow intake, droughty, percs slowly.	Slope, depth to rock, percs slowly.	Slope, droughty, erodes easily.
[illegible]	Severe slope.	Severe hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
[illegible]: [illegible]	Severe slope, seepage.	Severe seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty.
[illegible]*: [illegible]	Severe slope.	Severe piping.	Deep to water	Slope, erodes easily.	Erodes easily, slope.	Slope, erodes easily.
[illegible]*: [illegible]	Moderate seepage, slope.	Severe piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Lowry	Moderate seepage, slope.	Severe piping.	Deep to water	Slope	Erodes easily	Erodes easily.
[illegible]*: [illegible]	Severe slope.	Severe piping.	Deep to water	Slope, erodes easily.	Erodes easily, slope.	Slope, erodes easily.
Lowry	Severe slope.	Severe piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
[illegible]*: [illegible]	Severe slope.	Severe piping.	Deep to water	Slope, erodes easily.	Erodes easily, slope.	Slope, erodes easily.
[illegible]	Severe slope, seepage.	Severe seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty.
[illegible]: [illegible]	Moderate seepage.	Severe piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
[illegible]: [illegible]	Moderate seepage, slope.	Severe piping.	Deep to water	Slope	Erodes easily	Erodes easily.
[illegible]: [illegible]	Slight	Severe hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
We: Wenite	Slight	Severe: hard to pack.	Deep to water	Flooding, percs slowly, slow intake.	Percs slowly	Percs slowly
Wo, Wp: Worthing	Slight	Severe: hard to pack, ponding.	Ponding, frost action, percs slowly.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ar----------------- Artesian	0-5	[illegible]	[illegible]	A-6, A-7	0	100	100	90-100	70-95	35-50	[illegible]
	5-[illegible]	[illegible]	[illegible], MH	A-7	0	100	100	95-100	85-95	50-70	[illegible]
	[illegible]7-6[illegible]	[illegible] silty clay loam.	[illegible], MH	A-7	0	100	100	90-100	70-90	50-85	[illegible]
BeB, Be[illegible]---------- Beadle	0-[illegible]	Loam	[illegible]	A-[illegible], A-[illegible]	0-5	95-100	95-100	85-100	65-95	30-50	[illegible]
	[illegible]	[illegible]	[illegible]	A-7	0-5	90-100	85-100	75-95	55-95	40-60	[illegible]
	23-6[illegible]	[illegible]	[illegible], ML, MH	A-[illegible], A-7	0-5	90-100	85-100	75-95	55-85	35-55	[illegible]
BeB*: Beadle-------------	0-[illegible]	Loam	[illegible]	A-[illegible], A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	A-7	0-5	90-100	85-100	75-95	55-95	40-60	[illegible]
	23-6[illegible]	[illegible]	[illegible]	A-[illegible], A-7	0-5	90-100	85-100	75-95	55-85	35-55	[illegible]
Jerauld------------	0-[illegible]	[illegible]	[illegible]	A-4, A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-9	[illegible] clay loam.	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9-[illegible]	[illegible]	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	14-60	[illegible] clay loam.	[illegible] MH, ML	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BeF*: Betts-------------	0-3	Loam	[illegible]	[illegible], A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3-[illegible]	Loam, clay loam	[illegible]	A-[illegible], A-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	25-[illegible]	Clay loam, loam	[illegible]	A-[illegible], A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Java-------------	0-8	Loam	ML, [illegible]	A-4, A-6, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8-35	Loam, clay loam	[illegible]	A-[illegible], A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	35-60	Loam, clay loam	[illegible]	A-[illegible], A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bn, Bo*----------- Bon	[illegible]	Loam	[illegible]	A-4, A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Stratified silty clay loam to fine sandy loam.	[illegible]	A-4, A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bu---------------- Bullcreek	[illegible]	Clay	[illegible], CH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-6[illegible]	Clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ca---------------- Carter	[illegible]-4	[illegible] loam	[illegible]	A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-1[illegible]	[illegible]	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-6[illegible]	Clay, silty clay	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cp*: Carter-----------	0-4	[illegible] loam	[illegible]	A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-18	Clay, silty clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	18-60	Clay, silty clay	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Promise-----------	[illegible]	[illegible]	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-4[illegible]	Clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	42-60	Clay, silty clay	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cr*: Cavo-------------	0-8	Silt loam, loam	[illegible]-ML	A-4, A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8-19	Clay loam, clay	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	19-60	Clay loam, clay	[illegible]	A-7, A-6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
[illegible]*:											
[illegible]	0-2	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	2-9	Silty clay, clay, clay loam.	[illegible]	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	9-14	Silty clay, clay, clay loam.	[illegible]	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	14-60	Silty clay, clay, clay loam.	[illegible], MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
[illegible]*:											
Chantier	0-3	Clay	[illegible], MH	A-7	0	[illegible]	100	[illegible]	85-[illegible]	65-85	[illegible]
	3-8	Clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-50
	8-[illegible]	[illegible] clay, very [illegible] clay.	[illegible]	A-7	0	100	95-[illegible]	[illegible]	[illegible]	65-105	[illegible]-80
	[illegible]-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
[illegible]	0-4	[illegible]	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	60-[illegible]	[illegible]-55
	4-[illegible]	[illegible], very [illegible]	[illegible], MH	A-7	[illegible]	[illegible]-100	[illegible]	75-[illegible]	[illegible]	60-[illegible]	25-55
	[illegible]-60	Weathered bedrock	[illegible], MH	A-7	0	100	100	90-100	80-100	60-90	25-55
[illegible]*:											
[illegible]	0-[illegible]	Silt loam	[illegible], [illegible]-ML, [illegible]	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	[illegible]-20	Silty clay, silty clay loam.	[illegible]	A-7	0	100	100	90-100	80-100	40-65	15-35
	20-48	[illegible], silty clay loam.	[illegible]	A-7	0	100	95-100	90-100	80-100	40-65	15-35
	48-60	Loam, clay loam	[illegible], MH, ML	A-6, A-7	0	100	95-100	90-100	80-100	30-65	12-32
[illegible]	0-7	Silt loam	ML, [illegible]	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	5-20
	7-36	Silty clay loam, [illegible]	[illegible], ML	A-6, A-7	0	100	95-100	95-100	80-100	35-50	10-25
	36-60	[illegible] loam, loam, clay.	[illegible]	A-7	0	95-100	85-100	75-100	60-95	40-70	16-42
[illegible]	0-2	Silt loam	[illegible]-ML	A-4, A-6	0	100	100	90-100	60-100	25-40	5-15
	[illegible]	[illegible] clay, [illegible]	[illegible]	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	9-[illegible]	[illegible]	[illegible]	A-7	0	95-100	95-100	90-100	55-95	45-70	20-40
	14-60	[illegible] clay, clay loam.	[illegible], MH, ML	A-7	0	95-100	95-100	85-100	55-90	40-85	20-45
[illegible]	0-4	[illegible]	[illegible]	A-4, A-6	0	90-100	90-100	80-95	60-75	28-40	8-20
	4-[illegible]	[illegible], fine sandy loam, sandy loam.	[illegible]	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	[illegible]	Very gravelly sand, very gravelly loamy sand, gravelly sand.	[illegible]	A-1, A-2	0-5	60-100	40-80	15-50	3-30	<25	NP-5
[illegible]	0-[illegible]	Silt loam	[illegible]	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	[illegible]-27	[illegible] loam, very fine sandy loam.	[illegible]	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	27-60	[illegible] clay, [illegible] silty clay loam.	[illegible], MH, ML	A-7	[illegible]	100	100	90-100	80-100	40-75	15-40
[illegible]	0-[illegible]	Silt loam	[illegible]	A-4, A-6	0	100	100	85-100	60-90	20-35	3-15
	[illegible]-19	[illegible] clay, clay, [illegible]	[illegible], MH	A-7	0	95-100	95-100	85-100	65-95	50-85	20-50
	19-60	Silty clay, clay, clay loam.	[illegible]	A-7	0	95-100	95-100	85-100	60-95	40-75	15-50

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
EaA*:											
Eakin	0-7	Silt loam	[illegible]	A-4, A-6, [illegible]	[illegible]	100	100	95-100	[illegible]	[illegible]	[illegible]
	7-36	Silty clay loam, silt loam.	[illegible], ML	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	36-60	Clay loam, loam, clay.	[illegible], CH	A-7	[illegible]	95-100	85-100	75-100	60-[illegible]	[illegible]	[illegible]
DeGrey	0-10	Silt loam	[illegible]	A-4, A-6	[illegible]	100	100	[illegible]	[illegible]	[illegible]	[illegible]
	10-20	Silty clay, silty clay loam.	[illegible], CH	A-7	[illegible]	[illegible]	100	[illegible]	[illegible]	[illegible]	[illegible]
	20-48	Silty clay, silty clay loam.	[illegible]	A-7	[illegible]	100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	48-60	Loam, clay loam	CL, CH, MH, ML	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eg: Egas	0-[illegible]	Silty clay loam	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Silty clay, silty clay loam, clay.	[illegible], MH	A-7	[illegible]	[illegible]	100	[illegible]	[illegible]	[illegible]	[illegible]
Ev: Egas Variant	[illegible]	Silty clay loam	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Silty clay loam, silty clay	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	20-60	[illegible] loam, silty clay, clay loam.	[illegible], MH	A-7	[illegible]	95-[illegible]	85-100	[illegible]	[illegible]	[illegible]	[illegible]
Fa: Farnsworth	0-[illegible]	Silt loam	[illegible]	A-4, A-6	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Clay, silty clay	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	26-[illegible]	Clay, silty clay, silty clay loam.	[illegible], MH	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GeF, GhF: Gettys	[illegible]	Clay loam	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Clay loam	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	39-60	Clay loam, clay	CL, CH, MH	A-7	0	95-100	90-100	[illegible]	[illegible]	[illegible]	[illegible]
GhA: Glenham	0-4	Loam	CL, ML	A-6, A-7, A-4	0	95-100	95-100	[illegible]	[illegible]	[illegible]	[illegible]
	4-11	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	[illegible]	[illegible]	[illegible]	[illegible]
	11-60	Clay loam, loam	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GkB*:											
Glenham	0-4	Loam	[illegible], ML	A-6, A-7, A-4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-11	Clay loam, loam	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11-60	Clay loam, loam	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Java	0-8	Loam	ML, [illegible]	A-4, A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8-[illegible]	Loam, clay loam	[illegible], ML	A-6, A-7	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-60	Loam, clay loam	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HgB*, HgC*:											
Highmore	0-6	Silt loam	ML, [illegible]	A-4, A-6, A-7	0	100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	6-[illegible]	Silty clay loam	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-43	Silty clay loam, silt loam.	[illegible]	A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	43-60	Clay loam, loam	[illegible], CH	A-7	[illegible]	[illegible]	85-[illegible]	75-[illegible]	[illegible]	[illegible]	20-[illegible]
Java	0-8	Loam	[illegible]	A-4, A-6, A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8-[illegible]	Loam, clay loam	[illegible], ML	A-6, A-7	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-60	Loam, clay loam	[illegible]	A-6, A-7	[illegible]	95-100	85-100	75-95	60-85	30-45	10-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
HmA*:											
Highmore	0-6	Silt loam	ML, CL	A-4, A-6, A-7	0	100	95-100	95-100	90-100	30-45	5-20
	6-21	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	21-60	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
Mobridge	0-14	Silt loam	ML, CL	A-6, A-4, A-7	0	100	100	90-100	[illegible]	30-45	5-20
	14-26	Silty clay loam, clay loam.	CL, ML, CH, MH	A-6, A-7	0	100	100	95-100	85-100	35-55	10-30
	26-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0-5	95-100	95-100	95-100	85-100	35-55	15-35
H[illegible]B:											
Hurley	0-2	Silt loam	CL, CL-ML	A-4, A-6	[illegible]	100	100	95-100	90-100	25-40	5-15
	2-30	Clay, shaly clay	CH, MH	A-7	0	100	100	95-100	80-100	50-90	20-55
	30-60	Weathered bedrock	CH, MH	A-7	0	100	100	95-100	80-100	50-100	20-65
HmA*:											
Hurley	0-2	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	2-30	Clay, shaly clay	CH, MH	A-7	0	100	100	95-100	80-100	50-90	20-55
	30-60	Weathered bedrock	CH, MH	A-7	0	100	100	95-100	80-100	50-100	20-65
Slickspots.											
JbE*:											
Java	0-8	Loam	ML, CL	A-4, A-6, A-7	0	95-100	95-100	80-95	60-85	30-45	5-20
	8-35	Loam, clay loam	CL, ML	A-6, A-7	0-5	95-100	85-100	80-95	60-85	30-45	10-20
	35-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	60-85	30-45	11-25
Betts	0-3	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-100	60-75	20-38	5-15
	3-25	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	60-85	30-45	10-25
	25-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	60-85	30-45	10-25
JgC*:											
Java	0-8	Loam	ML, CL	A-4, A-6, A-7	0	95-100	95-100	80-95	60-85	30-45	5-20
	8-35	Loam, clay loam	CL, ML	A-6, A-7	0-5	95-100	85-100	80-95	60-85	30-45	10-20
	35-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	85-100	75-95	60-85	30-45	10-25
Glenham	0-4	Loam	CL, ML	A-6, A-7, A-4	0	95-100	95-100	85-100	60-85	30-50	8-20
	4-11	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-85	30-50	10-25
	11-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-95	50-85	30-50	10-40
Ko:											
Kolls	0-2	Silty clay	CH, MH	A-7	0	100	100	95-100	85-100	51-70	25-50
	2-60	Clay	CH, MH	A-7	0	100	100	95-100	85-100	60-90	25-55
La:											
Lane	0-8	Silty clay loam	CL, MH, ML, CH	A-6, A-7	0	100	100	95-100	75-100	35-55	11-25
	8-19	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	75-100	45-65	15-35
	19-60	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0	100	95-100	85-100	65-100	35-65	15-40
Lf*:											
Lane	0-8	Silt loam	CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	8-20
	8-19	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	75-100	45-65	15-35
	19-60	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0	100	95-100	85-100	65-100	35-65	15-40
Farnsworth	0-8	Silt loam	ML, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	4-15
	8-26	Clay, silty clay	CH, MH	A-7	0	100	100	95-100	85-95	50-70	20-40
	26-60	Clay, silty clay, clay loam.	CH, MH	A-7	0	95-100	95-100	85-100	80-95	50-65	20-35

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
LoA, [illegible] Lowry	[illegible]	[illegible]	[illegible]-ML	A-4, A-6	0	100	[illegible]	75-100	80-100	25-40	5-15
	[illegible]	[illegible]	[illegible]	A-4, A-6	0	100	[illegible]	[illegible]	[illegible]	25-40	5-15
	[illegible]	[illegible] loam, very fine sandy loam.	[illegible]	A-4, A-6	0	100	[illegible]	[illegible]	[illegible]	25-40	3-15
LvA, [illegible] Lowry Variant	[illegible]	[illegible]	[illegible]	A-4, A-6	0	100	[illegible]	[illegible]	75-100	25-40	5-15
	11-20	Loam, silt loam	[illegible]	A-4, A-6	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5-15
	20-26	Very fine sandy loam, fine sandy loam.	[illegible]	A-4	0	[illegible]	[illegible]	[illegible]	45-55	20-35	NP-10
	26-36	Stratified loamy very fine sand to sand.	[illegible]	[illegible], A-4	0	[illegible]	[illegible]	[illegible]	[illegible]-45	[illegible]	NP-7
Ma[illegible], Mb [illegible] Ma[illegible]	[illegible]	[illegible]	[illegible]	A-4, A-6	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5-15
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15-35
	[illegible]	[illegible]	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-80	20-50
[illegible]	[illegible]	[illegible]	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15-35
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5-20
	[illegible]	[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-30
	[illegible]	[illegible] clay loam, silt loam.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35-55	15-35
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-45	5-20
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35-55	10-30
	[illegible]	[illegible] clay loam, silt loam.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15-35
Plankinton	0-6	Silt loam	[illegible]	A-4, A-6	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5-15
	6-24	Clay, silty clay, clay loam.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15-35
	24-60	Clay, silty clay, silty clay loam.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15-30
[illegible]	0-4	Loam	[illegible]	A-4, A-6, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30-45	5-20
	4-14	Loam, clay loam	[illegible]	[illegible], A-6, [illegible]	[illegible]	[illegible]	[illegible]	60-95	[illegible]	31-45	5-20
	14-24	Loam, sandy loam	[illegible]	[illegible]	0	[illegible]-95	[illegible]-95	[illegible]-95	[illegible]-75	[illegible]-45	5-20
	24-60	Very gravelly sand, very gravelly loamy sand, gravelly sand.	[illegible]	[illegible]	[illegible]	30-85	30-75	10-60	0-30	<25	NP-7

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
OdB*:											
Oahe	0-4	Loam	ML, CL	A-4, A-6, A-7	0	[illegible]	[illegible]	[illegible]	50-80	[illegible]	5-20
	4-14	Loam, clay loam	CL, ML	A-4, A-6, A-7	0	[illegible]	[illegible]	[illegible]	[illegible]-75	[illegible]	5-20
	14-24	Loam, sandy loam	CL, CL-ML, [illegible]	A-2, A-4, A-6, A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5-[illegible]
	24-60	Very gravelly sand, very gravelly loamy sand, gravelly sand.	[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NP-7
Delmont	0-4	[illegible]	[illegible]	A-6, A-4	0	[illegible]	[illegible]	[illegible]	[illegible]-75	[illegible]	[illegible]
	4-[illegible]	[illegible], fine sandy loam, sandy loam.	[illegible]	A-4, A-6	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	15-60	Very gravelly sand, very gravelly loamy sand, gravelly sand.	[illegible]	A-1, A-2	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NP-5
OeF: Okaton	0-4	[illegible] silty clay	[illegible], MH	A-7	25-50	[illegible]	[illegible]	90-[illegible]	85-[illegible]	50-8[illegible]	[illegible]
	4-16	Clay, silty clay, shaly clay	[illegible], MH	A-7	25-50	[illegible]	[illegible]	[illegible]	[illegible]	50-85	[illegible]
	16-60	Weathered bedrock	[illegible], MH	A-7	---	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OkB: [illegible]ko	0-5	[illegible]	[illegible]	A-6, A-7	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5-[illegible]	[illegible]	[illegible]	A-7	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17-60	[illegible]	[illegible]	A-7	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-40
OmE, OmF: [illegible]pa	0-5	Silty clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25-45
	5-[illegible]	Clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]-60	Weathered bedrock	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-60
OpB: [illegible]pa	0-4	Clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	60-80	25-45
	4-[illegible]	Clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	12-[illegible]	Clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	19-24	Clay, shaly clay, very shaly clay	[illegible], MH	A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]-95	[illegible]
	24-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Or. Orthents											
OtA, OtB: Orton	0-6	Loam	[illegible]	A-4, A-6	0	95-100	85-100	75-90	55-75	[illegible]	[illegible]
	6-14	Fine sandy loam, loam.	[illegible]	A-4	0	95-100	85-100	70-95	35-75	[illegible]	[illegible]
	14-37	Fine sandy loam, [illegible], sandy loam.	[illegible]	A-4	0	95-100	85-95	60-90	35-75	[illegible]	NP-10
	37-60	Gravelly sand, very gravelly sand.	[illegible]	A-1, A-[illegible]	0-5	30-60	25-60	15-40	0-30	[illegible]	NP-5
OwB*: Orton	0-6	Loam	[illegible]	A-4, A-6	0	95-100	85-100	75-90	55-75	[illegible]	[illegible]
	6-14	Fine sandy loam, loam.	[illegible]	A-4	0	95-100	85-100	70-95	35-75	[illegible]	NP-[illegible]
	14-37	Fine sandy loam, loam, sandy loam.	[illegible]	A-4	0	95-100	85-95	60-90	35-75	[illegible]	NP
	37-60	Gravelly sand, very gravelly sand.	[illegible]	A-1, A-[illegible]	0-5	30-60	25-60	15-40	0-30	25	NP-[illegible]

See footnote at end of table.

TABLE 15.—ENGINEERING INDEX PROPERTIES—Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number— 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
OwE*:											
Schamber	0-3	Loam	[illegible]	A-4, A-6	0-5	95-100	80-95	65-95	40-70	25-40	3-15
	3-60	Gravelly sand, gravelly loamy sand.	[illegible]	[illegible]	0-15	30-80	15-50	5-20	0-10	<25	NP-5
Pa Plankinton	0-6	Silt loam	[illegible]	A-4, A-6	0	100	100	90-100	[illegible]	[illegible]	[illegible]
	6-24	Clay, silty clay, clay loam.	[illegible]	A-7	0	100	95-100	90-100	[illegible]	[illegible]	[illegible]
	24-60	Clay, silty clay, silty clay loam.	[illegible]	A-6, A-7	[illegible]	95-100	90-100	85-100	[illegible]	[illegible]	[illegible]
PrA, PrB Promise	0-7	Silty clay	[illegible]	A-7	[illegible]	100	100	90-100	[illegible]	[illegible]	[illegible]
	7-42	Clay	[illegible]	A-7	[illegible]	100	100	90-100	[illegible]	[illegible]	[illegible]
	42-60	Clay, silty clay	[illegible]	A-7	0	100	100	90-100	[illegible]	[illegible]	[illegible]
ReA, ReB Reo	0-7	Loam	[illegible]	A-4, A-6, A-7	[illegible]	95-100	90-100	80-100	[illegible]	[illegible]	[illegible]
	7-20	Clay loam, sandy clay loam, silty clay loam.	[illegible]	A-6, A-7	[illegible]	100	90-100	70-100	[illegible]	[illegible]	[illegible]
	20-60	Stratified fine sandy loam to clay loam.	[illegible]	A-4, A-6, A-7	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RaF*:											
Rock outcrop.											
Sansarc	0-4	[illegible]	[illegible]	A-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-15	Shaly clay, very shaly clay, clay.	CH, MH	A-7	0	80-100	75-100	75-100	75-100	60-90	25-55
	15-60	Weathered bedrock	CH, MH	A-7	0	100	100	90-100	[illegible]	[illegible]	[illegible]
SaE*, SaF*:											
Sansarc	0-4	[illegible]	[illegible]	A-7	0	100	95-100	90-100	[illegible]	[illegible]	[illegible]
	4-15	[illegible]	[illegible]	A-7	0	80-100	75-100	75-100	[illegible]	[illegible]	[illegible]
	[illegible]	Weathered bedrock	[illegible]	A-7	0	100	100	90-100	80-100	60-90	25-55
Opal	[illegible]	[illegible]	[illegible]	A-7	0	100	100	90-100	80-100	60-80	25-45
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Weathered bedrock	[illegible]	A-7	0	100	95-100	90-100	85-100	60-95	25-60
ScE Schamber	0-3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3-60	[illegible]	[illegible]	A-1	0-15	30-60	15-50	5-20	0-10	<25	NP-5
[illegible] Sully	0-4	Silt loam	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-60	Silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	20-40	3-15
SoC*, SoE*:											
Sully	0-4	Silt loam	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-60	Silt loam, very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	20-40	3-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
[illegible]*, SoE*: [illegible]ery	0-7	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-15
	7-15	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-15
	15-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-100	25-40	3-15
SoE*: Sully	0-4	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	3-15
	4-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	3-15
Schamber	0-3	Loam	ML, SM	A-4, A-6	0-5	95-100	80-95	65-95	40-70	25-40	3-15
	3-60	Gravelly sand, gravelly loamy sand.	[illegible], SM-GM	A-1	5-15	40-80	15-50	5-20	0-10	<25	NP-5
UmA, UmB, UmC: Uly	0-9	Silt loam	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	9-23	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	23-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Wd: Wendte	0-5	Silty clay	CH, MH	A-7	0	100	100	95-100	95-100	50-80	20-45
	5-60	Stratified silty clay loam to clay.	CL, CH, MH	A-7	0	100	100	95-100	70-100	45-80	20-45
We: Wendte	0-5	Silty clay	CH, MH	A-7	0	100	100	95-100	80-100	50-80	20-45
	5-60	Stratified silty clay loam to clay.	CL, CH	A-7	0	100	100	95-100	70-100	45-80	20-45
Wo, Wp: Worthing	0-5	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-60	15-30
	5-36	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	36-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	[illegible]	40-65	15-30

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	In/hr	In/in	pH	mmhos/cm					Pct
Ar------------------	0-5	0.2-0.6	[illegible]	[illegible]-7.8	<2	Moderate	[illegible]	5	4L	3-5
Artesian	5-17	<0.2	[illegible]	[illegible]-7.8	[illegible]	Very high	0.37			
	17-60	<0.2	0.1[illegible]	7.4-8.4	2-8	Very high	[illegible]			
BeB, BeC-----------	0-6	0.6-2.0	[illegible]	[illegible]-7.3	[illegible]	[illegible]	.28	[illegible]	6	[illegible]
Beadle	6-[illegible]	0.[illegible]-0.6	[illegible]	[illegible]-8.4	[illegible]	[illegible]	[illegible]			
	[illegible]-60	0.2-0.6	[illegible]	7.4-8.4	2-8	Moderate	[illegible]			
BgB*:										
Beadle--------------	0-6	0.6-2.0	[illegible]	[illegible]-7.3	<2	[illegible]	0.28	[illegible]	6	2-4
	[illegible]-23	0.[illegible]-0.6	[illegible]	[illegible]-8.4	<2	[illegible]	[illegible]			
	23-60	0.2-0.6	[illegible]	7.4-8.4	2-8	Moderate	.37			
Jerauld------------	0-2	0.6-2.0	[illegible]	[illegible]-7.3	<4	Moderate	.43	1	6	[illegible]
	2-9	<0.2	[illegible]	[illegible]-9.0	[illegible]	[illegible]	[illegible]			
	9-14	<0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	14-60	<0.2	[illegible]	7.[illegible]	[illegible]	[illegible]	[illegible]			
BmF*:										
Betts---------------	0-3	0.6-2.0	[illegible]	[illegible]-8.4	<2	Moderate	.28	5	4L	1-3
	[illegible]	[illegible]	[illegible]	[illegible]-8.4	<2	Moderate	.37			
	[illegible]-60	[illegible]-0.6	0.17-[illegible]	[illegible]-8.4	2-8	Moderate	.37			
Java----------------	0-8	0.6-2.0	0.18-0.2[illegible]	[illegible]-7.8	<2	Moderate	.28	[illegible]	6	[illegible]
	8-[illegible]	0.6-[illegible]	[illegible]	[illegible]-8.4	<2	Moderate	.37			
	35-60	0.2-0.6	[illegible]	7.4-9.0	[illegible]	Moderate	0.37			
Bn, Bo*------------	0-28	0.6-2.0	[illegible]	6.6-8.4	<2	[illegible]	.28	[illegible]	5	[illegible]
Bon	28-60	0.6-6.0	[illegible]	[illegible]-9.0	<2	[illegible]	.32			
Bu------------------	0-3	0.06	[illegible]	[illegible]	<2	Very high	.37	[illegible]	4	[illegible]
Bullcreek	3-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Very high	.37			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Very high	.37			
	17-60	<0.06	[illegible]	[illegible]	[illegible]	Very high	.37			
Ca------------------	0-4	0.6-2.0	[illegible]	[illegible]-7.8	<2	Moderate	.37	[illegible]	6	2-4
Carter	4-[illegible]	<0.06	[illegible]	[illegible]	[illegible]	Very high	.37			
	[illegible]-60	<0.2	[illegible]	7.4-9.0	[illegible]	Very high	.37			
Cp*:										
Carter--------------	0-4	0.6-2.0	0.20-0.22	[illegible]-7.8	<2	Moderate	.37	1	6	[illegible]
	4-18	<0.06	[illegible]	[illegible]	[illegible]	Very high	.37			
	18-60	<0.2	[illegible]	[illegible]-9.0	[illegible]	Very high	.37			
Promise------------	0-7	<0.2	[illegible]	6.[illegible]-7.8	[illegible]	Very high	[illegible]	[illegible]	4	[illegible]
	7-4[illegible]	<0.2	[illegible]	[illegible]	[illegible]	Very high	[illegible]			
	4[illegible]-60	<0.2	[illegible]	7.4-9.0	2-4	Very high	[illegible]			
Ce*:										
Cavo----------------	0-8	0.6-2.0	[illegible]	6.[illegible]-7.[illegible]	<2	[illegible]	[illegible]	[illegible]	6	[illegible]
	8-19	[illegible]	[illegible]	[illegible]-8.4	[illegible]	[illegible]	[illegible]			
	19-60	0.06-0.6	[illegible]	[illegible]	[illegible]	Moderate	[illegible]			
Jerauld------------	0-2	0.6-2.0	[illegible]	[illegible]-7.3	<4	Moderate	[illegible]	1	6	[illegible]
	2-9	<0.2	[illegible]	[illegible]	2-8	[illegible]	[illegible]			
	9-14	<0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	14-60	<0.2	[illegible]	[illegible]-9.0	[illegible]	[illegible]	[illegible]			
Ch*:										
Chantier------------	0-3	<0.06	[illegible]	[illegible]-8.4	<4	Very high	.37	[illegible]	4	[illegible]
	3-8	<0.06	[illegible]	[illegible]	4-16	Very high	[illegible]			
	8-[illegible]	<0.06	[illegible]	[illegible]-9.0	[illegible]	Very high	[illegible]			
	[illegible]-60	---	---	---	---	----------------	----			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	In/hr	In/in	pH	Mmhos/cm					Pct
CaF*:										
Sansarc----------	0-4	0.06-0.2	[illegible]	6.6-8.4	2	Very high	0.37	2	4	1-2
	4-15	0.06-0.2	[illegible]	[illegible]	2	Very high	0.37			
	15-60	---	---	[illegible]	---	-------	---			
DaA*:										
DeGrey----------	0-10	0.6-2.0	[illegible]	[illegible]	2	Low----------	0.37	3	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	2-8	High----------	0.37			
	[illegible]	0.06-0.6	[illegible]	[illegible]	[illegible]	High----------	0.37			
	48-60	0.2-0.6	[illegible]	7.9-9.0	4-16	Moderate------	0.37			
Eakin----------	0-7	0.6-2.0	[illegible]	[illegible]	<2	Moderate------	0.32	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate------	0.43			
	36-60	0.2-0.6	[illegible]	[illegible]	4	Moderate------	0.43			
Jerauld----------	0-2	0.6-2.0	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]	1	6	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	4-16	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	4-16	High----------	[illegible]			
DeD----------: Delmont	0-4	0.6-2.0	0.18-0.20	[illegible]	[illegible]	[illegible]	0.28	3	6	[illegible]
	4-16	0.6-6.0	0.12-0.18	[illegible]	[illegible]	[illegible]	[illegible]			
	16-60	6.0-20	0.03-0.06	[illegible]	2	[illegible]	[illegible]			
Do----------: [illegible]	[illegible]	0.6-2.0	[illegible]	[illegible]	2	[illegible]	0.32	5	5	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]			
	[illegible]	[illegible]	0.11-0.17	[illegible]	2-4	High----------	[illegible]			
Du----------: [illegible]	0-1	0.6-2.0	[illegible]	[illegible]	[illegible]	[illegible]	0.37	1	6	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High----------	0.37			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High----------	0.37			
EaA*:										
Eakin----------	0-7	0.6-2.0	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]			
	36-60	0.2-0.6	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]			
Dewey----------	[illegible]	0.6-2.0	[illegible]	[illegible]	<2	[illegible]	[illegible]	3	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	2-8	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	48-60	[illegible]	[illegible]	[illegible]	4-16	Moderate------	[illegible]			
Eg----------: Egas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	7	[illegible]
	1-60	0.06-0.2	[illegible]	[illegible]	[illegible]	High----------	[illegible]			
Em----------: Egas Variant	[illegible]	[illegible]	[illegible]	[illegible]	4	High----------	[illegible]	5	8	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	7.4-9.0	[illegible]	High----------	[illegible]			
Fm----------: [illegible]	[illegible]	0.6-2.0	[illegible]	[illegible]	2	Moderate------	[illegible]	3	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.37			
[illegible]----------: [illegible]	[illegible]	0.2-0.6	[illegible]	[illegible]	<2	High----------	[illegible]	5	4L	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	2	High----------	[illegible]			
	[illegible]	0.2-0.6	[illegible]	[illegible]	<4	High----------	[illegible]			
[illegible]----------: [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	11-60	[illegible]	[illegible]	[illegible]	[illegible]	Moderate------	[illegible]			
[illegible]*:										
[illegible]----------	[illegible]	[illegible]	[illegible]	[illegible]	2	Moderate------	[illegible]	5	6	2-4
	4-11	[illegible]	0.18-0.22	6.6-7.4	[illegible]	Moderate------	[illegible]			
	11-60	[illegible]	0.16-0.20	7.4-8.4	<4	Moderate------	[illegible]			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	In/hr	In/in	pH	Mmhos/cm					Pct
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	Moderate	0.28	5	6	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	2	Moderate	0.37			
	[illegible]	[illegible]	[illegible]	[illegible]	4	Moderate	0.37			
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.43			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	6	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	8	[illegible]	[illegible]			
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	6	4-6
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	2	Moderate	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	[illegible]	6	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Very high	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	2	Very high	----			
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	[illegible]	6	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	2	Very high	----			
[illegible]										
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	6	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	2	Moderate	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	4L	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	6	1-3
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	8	Moderate	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	6	2-4
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Very high	[illegible]	5	8	2-4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Very high	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	[illegible]	4-6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]:										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	7	4-6
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	0.11-0.20	7.4-8.4	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	0.18-0.22	5.6-7.3	[illegible]	Moderate	[illegible]	3	6	2-4
	[illegible]	[illegible]	0.10-0.14	6.1-7.8	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	0.08-0.12	7.4-9.0	[illegible]	[illegible]	[illegible]			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	In/hr	In/in	pH	mmhos/cm					Pct
LoA, LoB----------- Lowry	0-7	0.6-2.0	[illegible]	[illegible]	2	[illegible]	[illegible]	5	5	2-4
	7-15	0.6-2.0	[illegible]	[illegible]	2	[illegible]	[illegible]			
	15-60	0.6-2.0	0.15-0.20	[illegible]	2	[illegible]	0.43			
LvA, LvB----------- Lowry Variant	0-11	0.6-2.0	0.19-0.22	[illegible]	[illegible]	[illegible]	[illegible]	5	5	2-4
	11-20	0.6-2.0	[illegible]-0.22	[illegible]	2	[illegible]	[illegible]			
	20-26	0.6-2.0	0.15-0.17	[illegible]	[illegible]	[illegible]	[illegible]			
	26-36	6.0-20	0.06-0.10	[illegible]	[illegible]	[illegible]	[illegible]			
MaB, MaC----------- McClure	0-14	0.6-2.0	0.19-0.22	[illegible]	[illegible]	Moderate	[illegible]	5	6	2-4
	14-22	[illegible]	[illegible]-0.19	[illegible]	[illegible]	[illegible]	[illegible]			
	22-60	0.06-0.2	[illegible]-0.16	[illegible]	[illegible]	High	[illegible]			
MbA, MbB, MbC------ Millboro	0-5	0.06-0.2	[illegible]	[illegible]	2	High	0.37	5	4	2-4
	5-16	[illegible]-0.2	[illegible]	[illegible]	[illegible]	Very high	[illegible]			
	16-60	0.06-0.2	[illegible]	[illegible]	2-4	Very high	[illegible]			
MoA---------------- Mobridge	0-14	0.6-2.0	0.19-0.22	6.1-7.3	2	[illegible]	0.32	5	6	4-6
	14-26	0.6-2.0	[illegible]	[illegible]	2	Moderate	[illegible]			
	26-60	0.6-2.0	[illegible]	7.4-8.4	[illegible]	Moderate	0.43			
Mp*: Mobridge----------	0-14	0.6-2.0	0.19-[illegible]	[illegible]	2	[illegible]	[illegible]	5	6	4-6
	14-26	0.6-2.0	0.19-[illegible]	[illegible]	[illegible]	Moderate	[illegible]			
	26-60	0.6-2.0	[illegible]	7.4-8.4	2	Moderate	0.43			
Plankinton--------	0-6	0.6-2.0	0.19-[illegible]	[illegible]	[illegible]	Moderate	[illegible]	5	6	[illegible]
	6-24	[illegible]-0.2	[illegible]	[illegible]	[illegible]	High	[illegible]			
	24-60	0.06-0.6	[illegible]	[illegible]	[illegible]	High	[illegible]			
Oa----------------- Oahe	0-4	0.6-2.0	0.18-0.2[illegible]	[illegible]	2	Low	[illegible]	4	6	2-4
	4-14	0.6-2.0	0.15-[illegible]	[illegible]	2	Low	[illegible]			
	14-24	0.6-2.0	[illegible]	7.4-8.4	2	Low	[illegible]			
	24-60	6.0-20	0.03-[illegible]	7.4-8.4	2	Low	[illegible]			
OdB*: Oahe--------------	0-4	0.6-2.0	0.18-[illegible]	[illegible]	[illegible]	Low	[illegible]	4	6	2-4
	4-14	0.6-2.0	[illegible]	[illegible]	[illegible]	Low	[illegible]			
	14-24	0.6-2.0	[illegible]	[illegible]	[illegible]	Low	[illegible]			
	24-60	6.0-20	[illegible]	7.4-8.4	2	Low	[illegible]			
Delmont-----------	0-4	0.6-2.0	0.18-[illegible]	6.1-7.8	[illegible]	Low	0.28	3	6	2-4
	4-16	0.6-6.0	[illegible]	[illegible]	[illegible]	Low	[illegible]			
	16-60	6.0-20	[illegible]	7.4-8.4	2	Low	[illegible]			
OeF---------------- Okaton	0-4	0.06-0.2	0.11-0.16	7.4-8.4	[illegible]	High	[illegible]	2	8	1-2
	4-16	0.06-0.2	0.11-0.16	7.4-8.4	[illegible]	[illegible]	[illegible]			
	16-60	---	---	---	---	---	---			
OkB---------------- Oko	0-5	0.6-2.0	0.18-0.20	[illegible]	[illegible]	Moderate	[illegible]	5	6	2-4
	5-12	0.06-0.2	0.11-0.17	[illegible]	[illegible]	[illegible]	[illegible]			
	12-60	0.06-0.2	0.08-0.12	[illegible]	[illegible]	High	[illegible]			
OmB, OmC----------- Opal	0-5	<0.06	0.10-0.14	[illegible]	[illegible]	Very high	[illegible]	4	[illegible]	[illegible]
	5-37	<0.06	0.08-0.14	[illegible]	[illegible]	Very high	[illegible]			
	37-60	<0.06	---	[illegible]	[illegible]	Very high	---			
OpB---------------- Opal	0-4	<0.06	0.10-0.14	[illegible]	[illegible]	Very high	[illegible]	4	4	[illegible]
	4-12	<0.06	0.08-0.14	[illegible]	[illegible]	Very high	[illegible]			
	12-19	<0.06	0.08-0.12	[illegible]	[illegible]	Very high	[illegible]			
	19-24	<0.06	0.08-0.12	[illegible]	[illegible]	Very high	[illegible]			
	24-60	---	---	---	---	---	---			
Or. Orthents										

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	In/hr	In/in	pH	mmhos/cm					Pct
OtA, OtB: Orton	0-6	0.6-2.0	[illegible]	6.6-7.8	[illegible]	[illegible]	0.24	4	5	2-4
	6-14	[illegible]	0.14-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	14-37	2.0-6.0	0.12-0.17	7.4-8.4	<2	Low	0.24			
	37-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	[illegible]			
OwE*: Orton	0-6	0.6-2.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	5	[illegible]
	6-14	0.6-6.0	0.14-0.20	6.6-7.8	<2	Low	[illegible]			
	14-37	2.0-6.0	0.12-0.17	7.4-8.4	<2	Low	[illegible]			
	37-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	[illegible]			
Schamber	0-3	0.6-2.0	0.15-0.18	[illegible]	<2	Low	0.28	2	6	.5-2
	3-60	>6.0	0.03-0.06	[illegible]	[illegible]	[illegible]	[illegible]			
Pa: Plankinton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	5.6-8.4	[illegible]	[illegible]	0.32			
PrA, PrB: Promise	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	7-42	<0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	42-60	<0.2	0.10-0.12	7.4-9.0	2-4	Very high	[illegible]			
ReA, ReB: [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	20-60	0.6-2.0	0.09-0.20	7.4-8.4	<2	Low	[illegible]			
RaF*: Rock outcrop.										
Sansarc	0-4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	4	[illegible]
	4-15	0.06-0.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	15-60	---	---	5.6-8.4	---	---	---			
SaE*, SaF*: Sansarc	0-4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]
	4-15	0.06-0.2	0.08-0.12	7.4-8.4	<2	Very high	0.37			
	15-60	---	---	5.6-8.4	---	---	---			
Opal	0-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]
	5-37	<0.06	0.08-0.14	7.4-8.4	<2	Very high	0.37			
	37-60	<0.06	---	6.6-8.4	<2	Very high	---			
ScE: Schamber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low	[illegible]			
[illegible]: Sully	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
SoC*, SoE*: Sully	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Lowry	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
SsE*: Sully	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	4-60	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low	[illegible]			
Schamber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]
	[illegible]	>6.0	0.03-0.06	7.4-8.4	<2	Low	[illegible]			
UmA, UmB, UmC: Ulm	0-9	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]	2-4
	9-23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	23-60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

See footnote at end of table

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
							K	T		
	In	In/hr	In/in	pH	mmhos/cm					Pct
Wd----------------- White	0-5	0.06-0.2	0.13-0.18	7.4-8.4	<2	High----------	0.28	5	4	2-4
	5-60	0.06-0.2	0.11-0.17	7.4-8.4	2	High----------	0.28			
We----------------- Wendte	0-5	0.06-0.2	0.15-0.18	7.4-8.4	<2	High----------	0.28	5	4	1-5
	5-60	0.06-0.2	0.11-0.17	7.4-8.4	[illegible]	High----------	0.28			
Wo, Wp------------- Worthing	0-5	0.2-0.6	0.19-0.22	5.6-7.3	2	Moderate------	.37	5	6	3-5
	5-36	0.06-0.2	0.13-0.16	6.1-7.8	[illegible]	High----------	.37			
	36-60	0.2-0.6	0.11-0.13	7.4-8.4	4-8	High----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.—SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Ar: Artesian	D	Rare	---	---	3.0-6.0	Apparent	Oct-Jun	>60	---	Low	High	Moderate.
BeB, BeC: Beadle	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
BgB*:												
Beadle	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Jerauld	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Bm*:												
Betts	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Java	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Bn: Bon	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bo*:												
Bon, occasionally flooded	B	Occasional	Brief	Apr-Oct	2.0-6.0	Apparent	Oct-Jun	>60	---	High	Moderate	Low.
Bon, rarely flooded	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bu: Bullcreek	D	None	---	---	>6.0	---	---	>60	---	Low	High	High.
Ca: Carter	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Cp*:												
Carter	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Promise	D	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Cr*:												
Cavo	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Jerauld	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Csh*:												
Chantier	D	None	---	---	>6.0	---	---	10-20	Soft	Low	High	Moderate.
Sansarc	D	None	---	---	>6.0	---	---	6-20	Soft	Low	High	Moderate.
[illegible]*:												
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Ewin	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
DaA*:												
Jerauld	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
DeB Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Dm Dorna	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Du Durrstein	D	Occasional	Brief	Apr-Oct	0-1.5	Apparent	Oct-Jun	>60	---	Moderate	High	High.
EaA*:												
Eakin	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
DeGrey	D	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Eg Egas	D	Occasional	Brief	Apr-Oct	0-1.0	Apparent	Oct-Jun	>60	---	High	High	Moderate.
Em Egas Variant	D	Frequent	Brief	Mar-Oct	+1-3.0	---	Jan-Dec	>60	---	High	High	High.
Fa Farnsworth	D	Rare	---	---	3.0-6.0	Apparent	Oct-Jun	>60	---	Moderate	High	Moderate.
GeF, GeP Gettys	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
GhA Glenham	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
GkB*:												
Glenham	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Java	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
HgB*, HgC*:												
Highmore	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Java	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
HmA*:												
Highmore	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Mobridge	B	Occasional	Very brief	Oct-Jun	>6.0	---	---	>60	---	Moderate	High	Low.
HoB Hurley	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
HsA*:												
Hurley	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate
Slickspots.												

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

[illegible]	[illegible]	[illegible]			High water table			Bedrock		[illegible]	[illegible]	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		[illegible]	[illegible]
					Ft			In				
[illegible]*:												
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
[illegible]*:												
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
[illegible]	[illegible]	None	---	---	+.5-1.5	Perched	Apr-Jun	>60	---	Moderate	High	Moderate.
[illegible]	C	Rare	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
[illegible]*:												
[illegible]	C	Rare	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
[illegible]	D	Rare	---	---	[illegible]	Apparent	[illegible]	[illegible]	---	Moderate	High	Moderate.
[illegible]	B	None	---	---	[illegible]	---	---	>60	---	Moderate	Moderate	Low.
[illegible]	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
[illegible] McClure	C	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
MbA, MbB, [illegible] Millboro	[illegible]	None	---	---	[illegible]	---	---	[illegible]	---	Low	High	Moderate.
[illegible] Mobridge	B	Occasional	Very brief	[illegible]	[illegible]	---	---	[illegible]	---	Moderate	High	Low.
[illegible]*:												
[illegible]	B	Occasional	Very brief	[illegible]	[illegible]	---	---	[illegible]	---	Moderate	High	Low.
[illegible]	[illegible]	None	---	---	[illegible]	Perched	[illegible]	[illegible]	---	Moderate	High	Moderate.
Oa: Oahe	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
[illegible]*:												
[illegible]	B	None	---	---	[illegible]	---	---	[illegible]	---	Low	Moderate	Low.
Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
[illegible]	D	None	---	---	>6.0	---	---	8-20	Soft	Low	High	High.
[illegible]	[illegible]	None	---	---	[illegible]	---	---	[illegible]	---	Low	High	Moderate

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Omb, Om[illegible]-----------: [illegible]pa.	D	None----------	---	---	>6.0	---	---	20-40	Soft	Low---------	High---------	Moderate.
[illegible]B-----------: [illegible]pa.	D	None----------	---	---	>6.0	---	---	20-40	Soft	Low---------	High---------	High.
Or. Orthents												
OtA, OtB-----------: Orton	B	None----------	---	---	>6.0	---	---	>60	---	Low---------	Low---------	Low.
OwE*: [illegible]ton-----------	B	None----------	---	---	>6.0	---	---	>60	---	Low---------	Low---------	Low.
Schamber-----------	A	None----------	---	---	>6.0	---	---	>60	---	Low---------	Moderate	Low.
Pa-----------: Plankinton	[illegible]	None----------	---	---	+1-1.0	Perched	Mar-Jun	>60	---	Moderate	High	Moderate.
PrA, PrB-----------: Promise	D	None----------	---	---	>6.0	---	---	>60	---	Low---------	High---------	Low.
RaA, RaB-----------: [illegible]	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	High---------	Low.
Ro*: Rock outcrop.												
Sansarc-----------	D	None----------	---	---	>6.0	---	---	4-20	Soft	Low---------	High---------	Moderate.
SaE*, SaF*: Sansarc-----------	D	None----------	---	---	>6.0	---	---	4-20	Soft	Low---------	High---------	Moderate.
Opal-----------	D	None----------	---	---	>6.0	---	---	20-40	Soft	Low---------	High---------	Moderate.
[illegible]-----------: Schamber	A	None----------	---	---	>6.0	---	---	>60	---	Low---------	Moderate	Low.
SdF-----------: Sully	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	High---------	Low.
SoC*, SoE*: Sully-----------	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	High---------	Low.
Lowry-----------	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
SsE*: Sully-----------	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	High---------	Low.
Schamber-----------	A	None----------	---	---	>6.0	---	---	>60	---	Low---------	Moderate	Low.
[illegible]A, [illegible]B, [illegible]-----------: [illegible]	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	High---------	Low.

See footnote at end of table.

TABLE [illegible].--S[illegible] AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Wd*: Wendte	D	Rare	---	---	>6.0	---	---	>60	---	Low	High	Low.
Wf: Wendte	D	Occasional	Brief	Apr-Oct	>6.0	---	---	>60	---	Low	High	Low.
W[illegible]: Worthing	D	None	---	---	[illegible]-1.0	Perched	[illegible]	>60	---	High	High	Moderate.
Wp: Worthing	D	None	---	---	+3-.5	Perched	Jan-Dec	>60	---	High	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.—ENGINEERING INDEX TEST DATA

[Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; MD, maximum dry density; and OM, optimum moisture]

Soil name, horizon, and depth in inches	Classification		Grain-size distribution							LL	PI	Moisture density	
			Percentage passing sieve—				Percentage smaller than—						
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			MD	OM
										Pct		Lb/ft3	Pct
Gettys clay loam													
A[illegible]----4 to 10	A-7-6(17)	CH	97	95	85	71	--	35	--	52	28	99	22
Ck2---14 to 28	A-7-6(19)	CH	98	97	91	74	--	58	--	57	34	[illegible]	[illegible]
Glenham loam													
B[illegible]----4 to 11	A-6(12)	CL	99	98	9[illegible]	70	--	31	--	4[illegible]	21	92	24
Ck----16 to 28	A-7-6(16)	CL	97	96	89	71	--	4[illegible]	--	50	28	[illegible]	[illegible]
Highmore silt loam:													
Ap------0 to 6	A-6(10)	CL	--	--	100	98	--	31	--	40	16	96	24
Bt------6 to 21	A-7-6(13)	CL	--	--	100	98	--	37	--	43	20	[illegible]	[illegible]
Ck1----26 to 38	A-7-6(13)	CL	--	100	99	98	--	37	--	42	22	[illegible]	19
Lowry silt loam													
Ap------0 to 7	A-4(8)	ML	--	--	100	99	--	17	--	32	7	104	20
Bw------7 to 11	A-4(8)	ML	--	--	100	93	--	19	--	32	8	[illegible]	9
Ck----38 to 51	A-4(8)	CL-ML	--	--	100	83	--	17	--	28	7	[illegible]	17
Mobridge silt loam:													
A-----0 to 15	A-7-6(11)	ML	--	100	98	93	--	37	--	45	18	86	30
Bt----15 to 29	A-7-6(18)	CH	--	100	98	94	--	51	--	54	28	93	25
Ck----35 to 60	A-7-6(19)	CH	98	97	91	75	--	46	--	53	32	[illegible]	[illegible]
Oahe loam													
Ap-----0 to 4	A-7-5(9)	ML	100	99	82	71	--	17	--	45	11	91	26
Bw------4 to 14	A-6(7)	CL	95	92	69	53	--	21	--	33	19	106	17
2C-----24 to 60	A-1-b(0)	SW-SC	56	46	21	8	--	5	--	--	--	--	--
Opal silty clay:													
A------0 to 5	A-7-5(20)	CH	--	--	100	98	--	59	--	67	36	82	32
Bw------5 to 25	A-7-5(20)	CH	--	--	100	99	--	77	--	80	50	88	30
Promise silty clay													
Ap-----0 to 7	A-7-5(20)	CH	--	--	100	98	--	53	--	62	31	85	31
Bw------7 to 19	A-7-6(20)	CH	--	--	100	99	--	61	--	65	37	92	26
Cy-----42 to 60	A-7-6(20)	CH	--	--	100	99	--	59	--	69	45	95	24
Ree loam													
A------0 to 6	A-7-6(10)	ML	97	94	84	79	--	22	--	42	18	95	24
Bt------6 to 14	A-7-6(11)	CL	97	90	75	67	--	24	--	43	20	105	19
C2----27 to 45	A-7-6(12)	CL	97	95	86	79	--	30	--	41	21	110	17
C3-----45 to 60	A-6(11)	CL	96	92	80	72	--	25	--	40	20	112	16
Schamber loam													
A------0 to 3	A-2-7(0)	SM	95	87	57	35	--	13	--	44	12	105	19
C------3 to 20	A-2-4(0)	SW-SM	75	64	27	12	--	6	--	36	8	--	--
Uly silt loam													
Ap------0 to 6	A-4(8)	ML	--	--	100	98	--	23	--	34	8	100	22
Bw------9 to 17	A-6(10)	ML	--	--	100	98	--	25	--	38	14	100	22
Ck-----23 to 55	A-6(10)	CL	--	--	100	98	--	33	--	38	16	106	19
Wendte silty clay													
A1, A2-0 to 5	A-7-6(20)	CH	--	100	99	84	--	47	--	62	34	88	30
C1, C2, C3-----5 to 40	A-7-5(20)	CH	--	100	99	88	--	55	--	66	[illegible]	89	28
C4-----40 to 60	A-7-6(20)	CH	--	--	100	89	--	53	--	66	37	[illegible]	[illegible]

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Artesian	Fine, montmorillonitic, mesic Vertic Haplustolls
Beadle	Fine, montmorillonitic, mesic Typic Argiustolls
[illegible]	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
[illegible]	Fine-loamy, mixed, mesic Cumulic Haplustolls
[illegible]	Very fine, montmorillonitic, mesic Vertic Haplustolls
*[illegible]	Very fine, montmorillonitic, mesic Vertic Paleustolls
[illegible]	Fine, montmorillonitic, mesic Typic Natrustolls
[illegible]	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
[illegible]	Fine, montmorillonitic, mesic Typic Natrustolls
[illegible]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
[illegible]	Coarse-silty over clayey, mixed, mesic Fluventic Haplustolls
[illegible]	Fine, montmorillonitic, mesic Typic Natraquolls
[illegible]	Fine-silty, mixed, mesic Typic Argiustolls
[illegible]	Fine, montmorillonitic (calcareous), mesic Typic Haplaquolls
[illegible]	Fine, mesic Typic Calciaquolls
[illegible]	Fine, montmorillonitic, mesic Typic Natrustolls
[illegible]	Fine, montmorillonitic (calcareous), mesic Typic Ustorthents
[illegible]	Fine-loamy, mixed, mesic Typic Argiustolls
[illegible]	Fine-silty, mixed, mesic Typic Argiustolls
[illegible]	Very fine, montmorillonitic, mesic Leptic Natrustolls
[illegible]	Fine-loamy, mixed, mesic Entic Haplustolls
[illegible]	Fine, montmorillonitic, mesic Leptic Natrustolls
[illegible]	Very fine, montmorillonitic (calcareous), mesic Vertic Haplaquolls
[illegible]	Fine, montmorillonitic, mesic Pachic Argiustolls
[illegible]	Coarse-silty, mixed, mesic Typic Haplustolls
[illegible]	Coarse-loamy, mixed, mesic Typic Haplustolls
*[illegible]	Fine, montmorillonitic, mesic Typic Argiustolls
[illegible]	Fine, montmorillonitic, mesic Vertic Argiustolls
[illegible]	Fine-silty, mixed, mesic Pachic Argiustolls
[illegible]	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
[illegible]	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Ustorthents
[illegible]	Fine, montmorillonitic, mesic Vertic Argiustolls
[illegible]	Very fine, montmorillonitic, mesic Vertic Haplustolls
Orthents	Loamy, mixed, mesic Typic Ustorthents
[illegible]	Coarse-loamy, mixed, mesic Typic Haplustolls
[illegible]	Fine, montmorillonitic, mesic Typic Argialbolls
Promise	Very fine, montmorillonitic, mesic Vertic Haplustolls
[illegible]	Fine-loamy, mixed, mesic Typic Argiustolls
[illegible]	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Ustorthents
*[illegible]	Sandy-skeletal, mixed, mesic Ustic Torriorthents
[illegible]	Coarse-silty, mixed (calcareous), mesic Typic Ustorthents
[illegible]	Fine-silty, mixed, mesic Typic Haplustolls
[illegible]	Fine, montmorillonitic (calcareous), mesic Vertic Ustifluvents
Worthing	Fine, montmorillonitic, mesic Typic Argiaquolls

*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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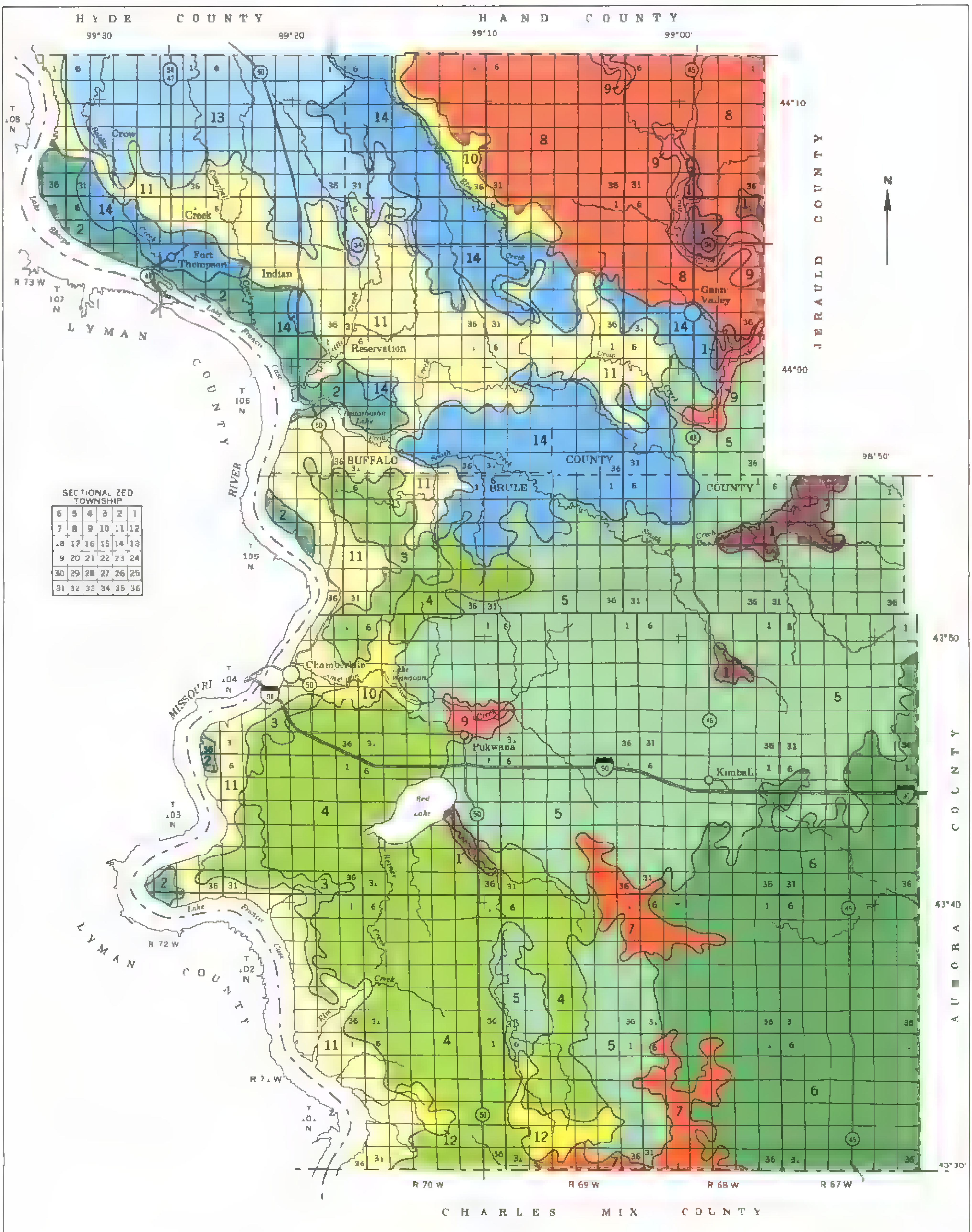


SOIL LEGEND*

NEARLY LEVEL TO ROLLING LOAMY SOILS UNDERLAIN BY SAND AND GRAVEL; ON OUTWASH PLAINS AND TERRACES

1 Oahe-Delmont association: Well drained and somewhat excessively drained, nearly level to rolling loamy soils that are shallow or moderately deep over sand and gravel; on outwash plains and terraces

NEARLY LEVEL TO STEEP, SILTY AND LOAMY SOILS ON UPLANDS AND IN UPLAND SWALES

2 Lowry-Sully association: Deep, well drained, nearly level to steep, silty soils on uplands

3 Uly association: Deep, well drained, nearly level to moderately sloping, silty soils on uplands

4 Highmore-Mobridge association: Deep, well drained and moderately well drained, nearly level to gently rolling, silty soils on uplands and in upland swales

5 Highmore-Java-Glenham association: Deep, well drained, nearly level to gently rolling, silty and loamy soils on uplands

6 Eakin-DeGrey association: Deep, well drained and moderately well drained, nearly level and gently undulating, silty soils on uplands

LEVEL TO GENTLY ROLLING, LOAMY AND SILTY SOILS ON UPLANDS AND IN UPLAND DEPRESSIONS

7 Beadle-Plankinton-Eakin association: Deep, well drained and poorly drained, level to gently rolling, loamy and silty soils on uplands and in upland depressions

8 Glenham-Java-Highmore association: Deep, well drained, nearly level to gently rolling, loamy and silty soils on uplands

LEVEL, SILTY SOILS ON FLOOD PLAINS

9 Durrstein-Egas association: Deep, poorly drained level, silty soils on flood plains

GENTLY SLOPING TO STEEP, CLAYEY AND LOAMY SOILS ON UPLANDS

10 Betts-Java association: Deep, well drained, strongly sloping to steep, loamy soils on uplands

11 Sansarc-Opal-Chantier association: Shallow and moderately deep, well drained, gently sloping to steep, clayey soils on uplands

12 Okaton association: Shallow, well drained, moderately steep and steep, clayey soils on uplands

NEARLY LEVEL TO STRONGLY SLOPING, CLAYEY SOILS ON UPLANDS

13 Opal, saline-Promise association: Moderately deep and deep, well drained, nearly level to strongly sloping, clayey soils that are dominantly saline; on uplands

14 Promise-Opal association: Deep and moderately deep, well drained, nearly level to strongly sloping, clayey soils on uplands

*The texture terms in the descriptive headings refer to the surface layer of the major soils in each association

Compiled 1983

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

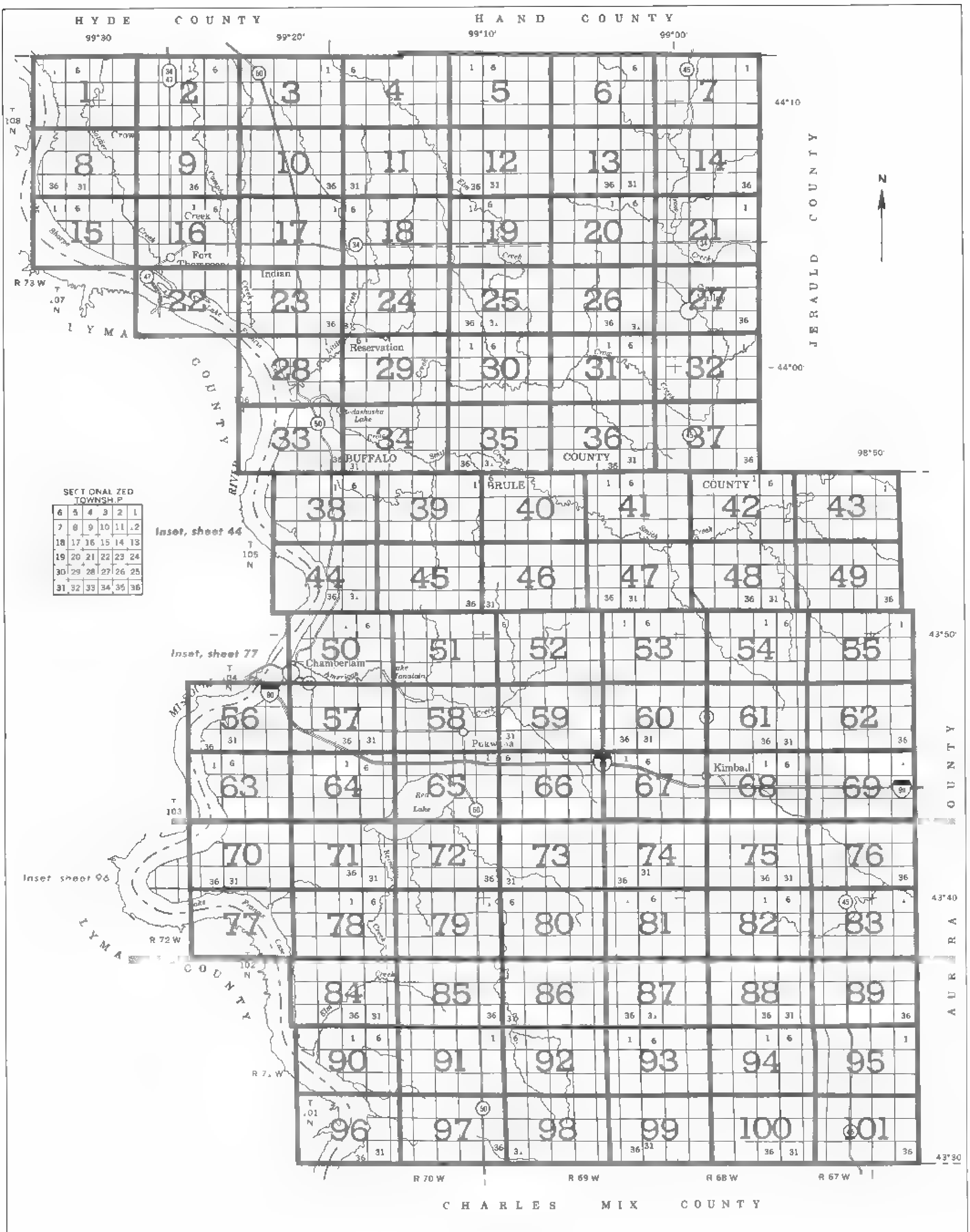
GENERAL SOIL MAP
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA

Scale 1:253 440

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lower case letter that follows separate map units having names that begin with the same letter, except that it does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
Ar	Artesian silty clay loam
BeB	Beadle loam, 2 to 6 percent slopes
BeC	Beadle loam, 6 to 9 percent slopes
BgB	Beadle-Jerauld complex, 1 to 5 percent slopes
BmF	Betts-Java loams, 20 to 40 percent slopes
Bn	Bon loam
Bo	Bon loam, channeled
Bu	Bullcreek clay
Ca	Carter silt loam
Cp	Carter-Promise complex
Cr	Cavo-Jerauld silt loams
CsD	Chanber-Sansarc clays, 2 to 15 percent slopes
DaA	DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes
DeD	Delmont loam, 6 to 15 percent slopes
Do	Dorna silt loam
Du	Durrstein silt loam
EaA	Eakin-DeGrey silt loams, 0 to 3 percent slopes
Eg	Egas silty clay loam
Ew	Egas Variant silty clay loam
Fa	Farmsworth silt loam
GeE	Gettys clay loam, 9 to 25 percent slopes
GeF	Gettys clay loam, 25 to 40 percent slopes
GhA	Glenham loam, 0 to 3 percent slopes
GkB	Glenham-Java loams, 3 to 6 percent slopes
HgB	Highmore-Java complex, 1 to 5 percent slopes
HgC	Highmore-Java complex, 5 to 9 percent slopes
HmA	Highmore-Mobridge silt loams, 0 to 4 percent slopes
HoB	Hurley silt loam, 0 to 6 percent slopes
HsA	Hurley-Slickspots complex, 1 to 4 percent slopes
JbE	Java-Betts loams, 9 to 20 percent slopes
JgC	Java-Glenham loams, 6 to 9 percent slopes
Ko	Kolls silty clay
La	Lane silty clay loam
Lf	Lane-Farmsworth silt loams
LoA	Lowry silt loam, 0 to 2 percent slopes
LoB	Lowry silt loam, 2 to 6 percent slopes
LvA	Lowry Variant silt loam, 0 to 2 percent slopes
LvB	Lowry Variant silt loam, 2 to 6 percent slopes
MaB	McClure silt loam, 2 to 6 percent slopes
MaC	McClure silt loam, 6 to 11 percent slopes
MbA	Millboro silty clay loam, 0 to 2 percent slopes
MbB	Millboro silty clay loam, 2 to 6 percent slopes
MbC	Millboro silty clay loam, 6 to 9 percent slopes
MoA	Mobridge silt loam
Mp	Mobridge-Plankinton silt loams
Oa	Oahe loam, 0 to 2 percent slopes
OdB	Oahe-Delmont loams, 2 to 6 percent slopes
OeF	Okaton bouldery silty clay, 15 to 40 percent slopes
OkB	Oko loam, 2 to 7 percent slopes
OmB	Opal silty clay, 2 to 6 percent slopes
OmC	Opal silty clay, 6 to 11 percent slopes
OpB	Opal clay, saline, 1 to 6 percent slopes
Or	Orthents, loamy
OtA	Orton loam, 0 to 2 percent slopes
OtB	Orton loam, 2 to 6 percent slopes
OwE	Orton-Schamber loams, 9 to 25 percent slopes
Pa	Plankinton silt loam
PrA	Promise silty clay, 0 to 2 percent slopes
PrB	Promise silty clay, 2 to 6 percent slopes
ReA	Ree loam, 0 to 3 percent slopes
ReB	Ree loam, 3 to 7 percent slopes
RsF	Rock outcrop-Sansarc complex, 15 to 40 percent slopes
SaE	Sansarc-Opal clays, 12 to 20 percent slopes
SaF	Sansarc-Opal clays, 20 to 40 percent slopes
ScE	Schamber loam, 9 to 30 percent slopes
SdF	Sully silt loam, 25 to 40 percent slopes
SoC	Sully-Lowry silt loams, 6 to 9 percent slopes
SoE	Sully-Lowry silt loams, 9 to 25 percent slopes
SsE	Sully-Schamber complex, 9 to 25 percent slopes
UaA	Uly silt loam, 0 to 2 percent slopes
UaB	Uly silt loam, 2 to 6 percent slopes
UaC	Uly silt loam, 6 to 9 percent slopes
Wd	Wendte silty clay
We	Wendte silty clay, channeled
Wo	Worthing silty clay loam
Wp	Worthing silty clay loam, ponded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Other roads

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State

RAILROAD

DAMS

- Large (to scale)
- Medium or small

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, single line
- Intermittent
- Drainage end
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

DeC ReA

MISCELLANEOUS

- Gravelly spot
- Dumps and other similar non soil areas
- Saline spot
- Sandy spot
- Stony spot, very stony spot
- Borrow Area
- Claypan spot
- Orthents

SEWAGE LAGOON

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separate map units having names that begin with the same letter, except that it does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
Ar	Artesian silty clay loam
BeB	Beadle loam, 2 to 6 percent slopes
BeC	Beadle loam, 6 to 9 percent slopes
BgB	Beadle-Jerauld complex, [illegible] to 5 percent slopes
BmF	Betts-Java loams, 20 to 40 percent slopes
Bn	Bon loam
Bo	Bon loam, channeled
Bu	Bullcreek clay
Ca	Carter silt loam
Cp	Carter-Promise complex
Cr	Cavo-Jerauld silt loams
CsD	Chantier-Sansarc clays, 2 to 15 percent slopes
DaA	DeGrey-Eakin-Jerauld silt loams, 0 to 2 percent slopes
[illegible]	Delmont loam, 6 to 15 percent slopes
Do	Dorna silt loam
Du	Durrstein silt loam
EaA	Eakin-DeGrey silt loams, 0 to 3 percent slopes
[illegible]	Egas silty clay loam
[illegible]	Egas Variant silty clay loam
[illegible]	Farmsworth silt loam
[illegible]	Gettys clay loam, 9 to 25 percent slopes
[illegible]	Gettys clay loam, 25 to 40 percent slopes
[illegible]	Glenham loam, 0 to [illegible] percent slopes
[illegible]	Glenham-Java loams, 3 to 6 percent slopes
[illegible]	Highmore-Java complex, [illegible] to 5 percent slopes
[illegible]	Highmore-Java complex, 5 to 9 percent slopes
[illegible]	Highmore-Mobridge silt loams, 0 to 4 percent slopes
[illegible]	Hurley silt loam, 0 to 6 percent slopes
[illegible]	Hurley-Slickspots complex, [illegible] to 4 percent slopes
[illegible]	Java-Betts loams, 9 to 20 percent slopes
[illegible]	Java-Glenham loams, 6 to 9 percent slopes
K	Kolls silty clay
[illegible]	[illegible] silty clay loam
[illegible]	[illegible] silt loams
[illegible]	[illegible] silt loam, 0 to 2 percent slopes
[illegible]	[illegible] silt loam, [illegible] to [illegible] percent slopes
[illegible]	[illegible] Variant silt loam, 0 to 2 percent slopes
[illegible]	[illegible] silt loam, 2 to 6 percent slopes

SYMBOL	NAME
MaB	McClure silt loam, 2 to 6 percent slopes
MaC	McClure silt loam, 6 to [illegible] percent slopes
MbA	Millboro silty clay loam, 0 to 2 percent slopes
MbB	Millboro silty clay loam, 2 to 6 percent slopes
MbC	Millboro silty clay loam, 6 to 9 percent slopes
MoA	Mobridge silt loam
Mp	Mobridge-Plankinton silt loams
Oa	Oahe loam, 0 to 2 percent slopes
OdB	Oahe-Delmont loams, 2 to 6 percent slopes
OeF	Okaton bouldery silty clay, [illegible]5 to 40 percent slopes
OkB	Oko loam, 2 to 7 percent slopes
OmB	Opal silty clay, 2 to 6 percent slopes
OmC	Opal silty clay, 6 to [illegible] percent slopes
OpB	Opal clay, saline, [illegible] to 6 percent slopes
Or	Orthents, loamy
OtA	Orton loam, 0 to 2 percent slopes
OtB	Orton loam, 2 to 6 percent slopes
OwE	Orton-Schamber loams, 9 to 25 percent slopes
Pa	Plankinton silt loam
PrA	Promise silty clay, 0 to 2 percent slopes
PrB	Promise silty clay, 2 to 6 percent slopes
ReA	Ree loam, 0 to 3 percent slopes
ReB	Ree loam, [illegible] to 7 percent slopes
RsF	Rock outcrop-Sansarc complex, 15 to 40 percent slopes
SaE	Sansarc-Opal clays, [illegible]2 to 20 percent slopes
SaF	Sansarc-Opal clays, 20 to 40 percent slopes
ScE	Schamber loam, 9 to 30 percent slopes
SdF	Sully silt loam, 25 to 40 percent slopes
SoC	Sully-Lowry silt loams, 6 to 9 percent slopes
SoE	Sully-Lowry silt loams, 9 to 25 percent slopes
SsE	Sully-Schamber complex, 9 to 25 percent slopes
JaA	[illegible]ly silt loam, 0 to 2 percent slopes
JaB	[illegible]ly silt loam, 2 to 6 percent slopes
JaC	[illegible]ly silt loam, 6 to 9 percent slopes
Wd	Wendte silty clay
We	Wendte silty clay, channeled
Wo	Worthing silty clay loam
Wp	Worthing silty clay loam, ponded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

County or parish

Reservation (national forest or park, state forest or park, and large airport)

Limit of soil survey (label)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

Other roads

ROAD EMBLEMS & DESIGNATIONS

Interstate

Federal

State

RAILROAD

DAMS

Large (to scale)

Medium or small

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

WATER FEATURES

DRAINAGE

Perennial, single line

Intermittent

Drainage end

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial

MISCELLANEOUS WATER FEATURES

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

DeC
ReA

MISCELLANEOUS

Gravelly spot

Dumps and other similar non soil areas

Saline spot

Sandy spot

Stony spot, very stony spot

Borrow Area

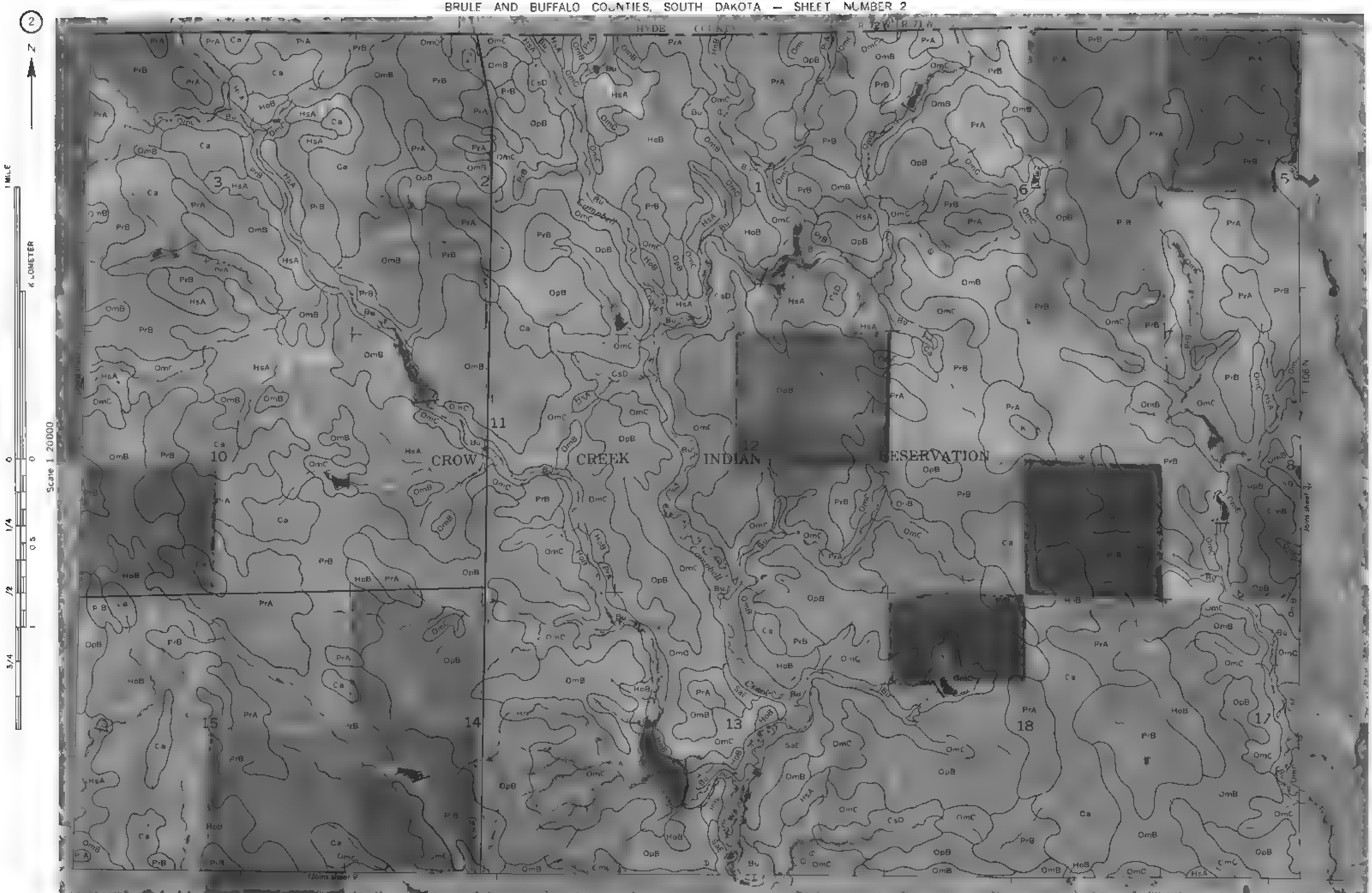
Claypan spot

Orthents

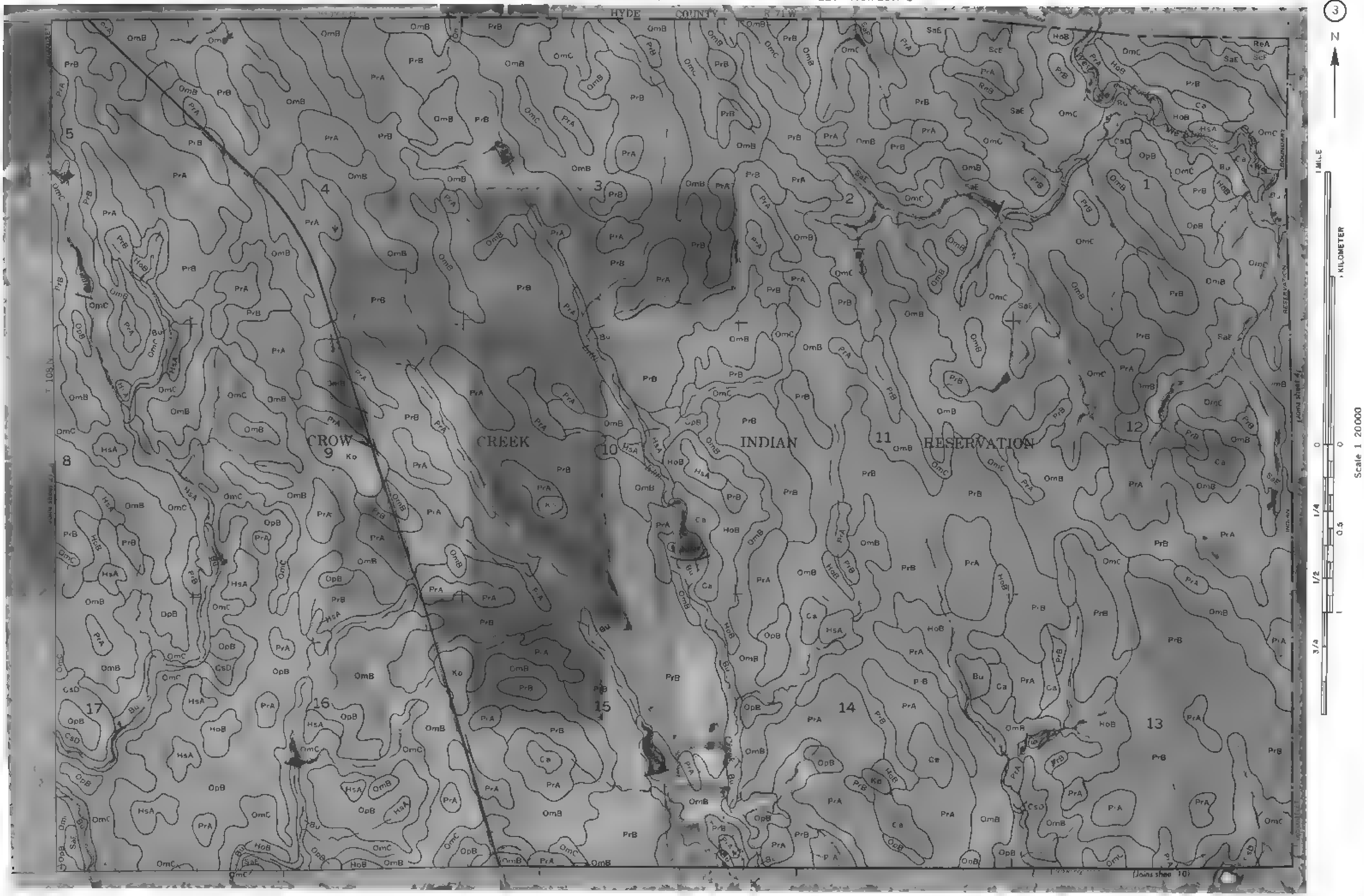
SEWAGE LAGOON

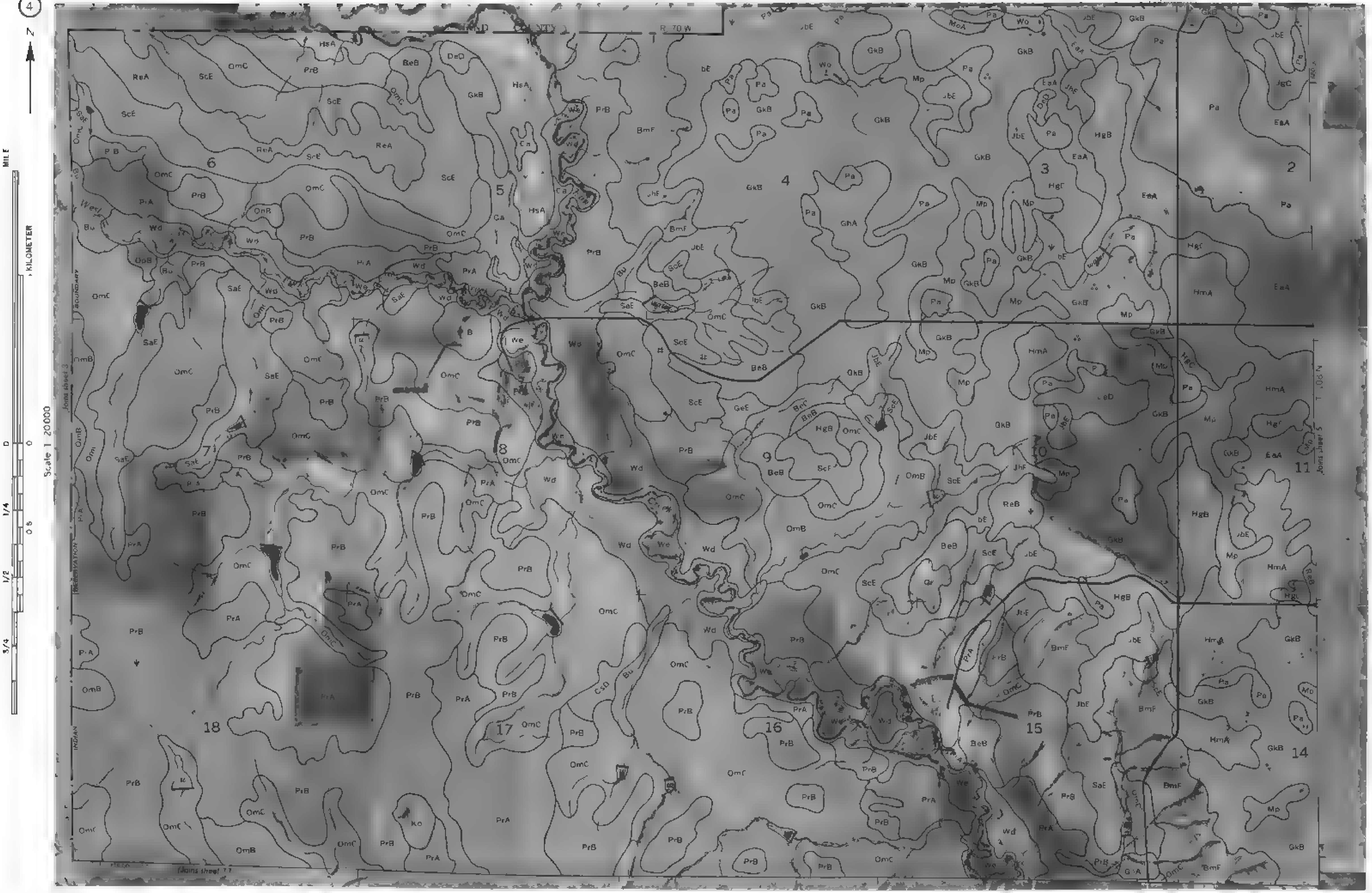
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 1

2



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 2

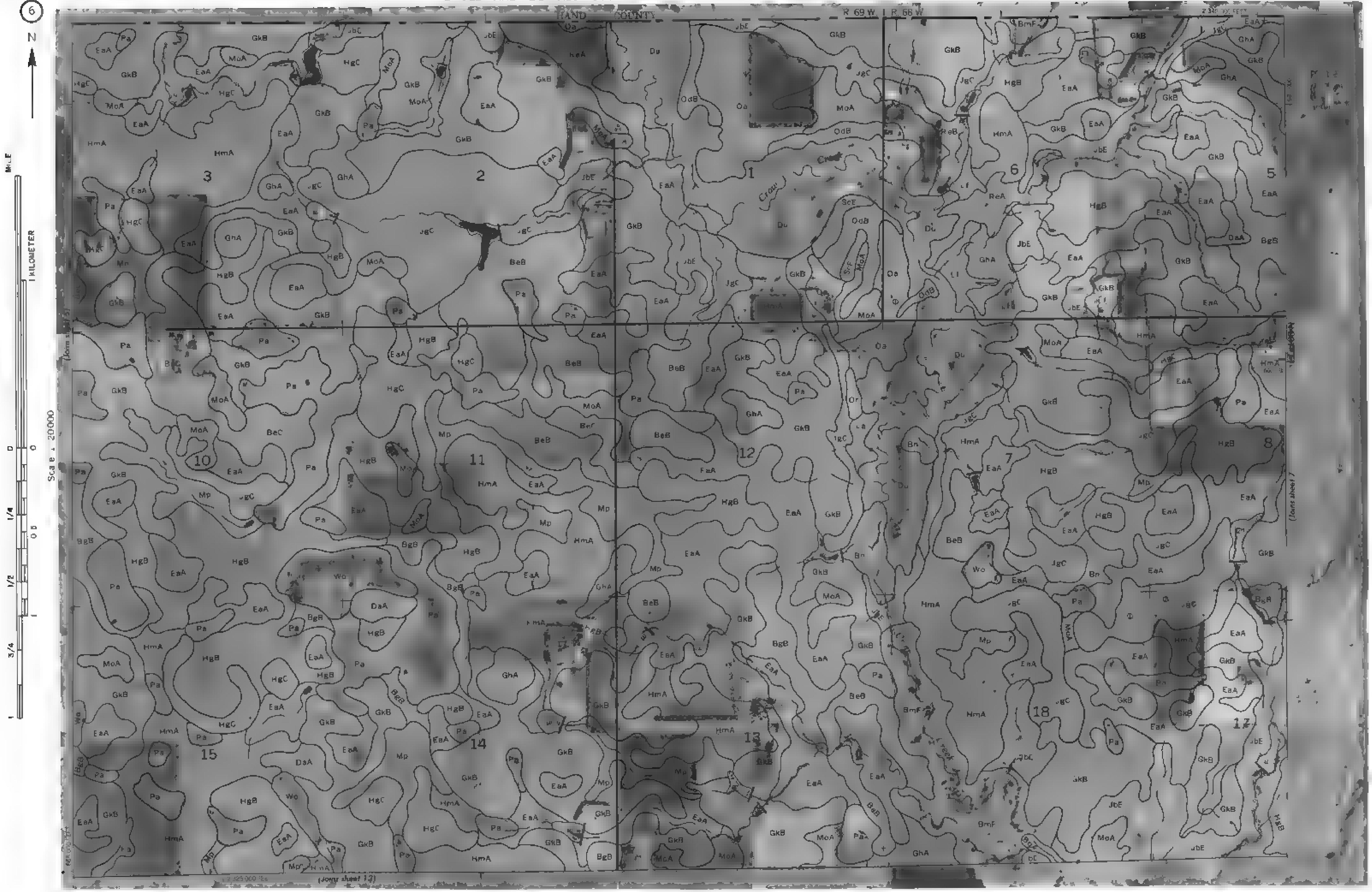

HYDE COUNTY
CROW CREEK INDIAN RESERVATION
N
Scale 1 20000
1 MILE
KILOMETER
(Joins sheet 10)


N
MILE
KILOMETER
Scale 1 20000
0
1/4
1/2
3/4
0.5
Joins sheet 3
Joins sheet 5
Joins sheet 11
Joins sheet 13
INDIAN RESERVATION BOUNDARY
R 70 W
T 106 N
2
3
4
5
6
7
8
9
10
11
14
15
16
17
18
OmC
PrB
PrA
ScE
ReA
GkB
Pa
Mp
Wd
We
BeB
HsA
BmF
EaA
HmA
HgB
JbE
SaE
OmB
Omc
Ca
DeD
MoA
Wo
GhA
Bu
Ko
CsD
BmF

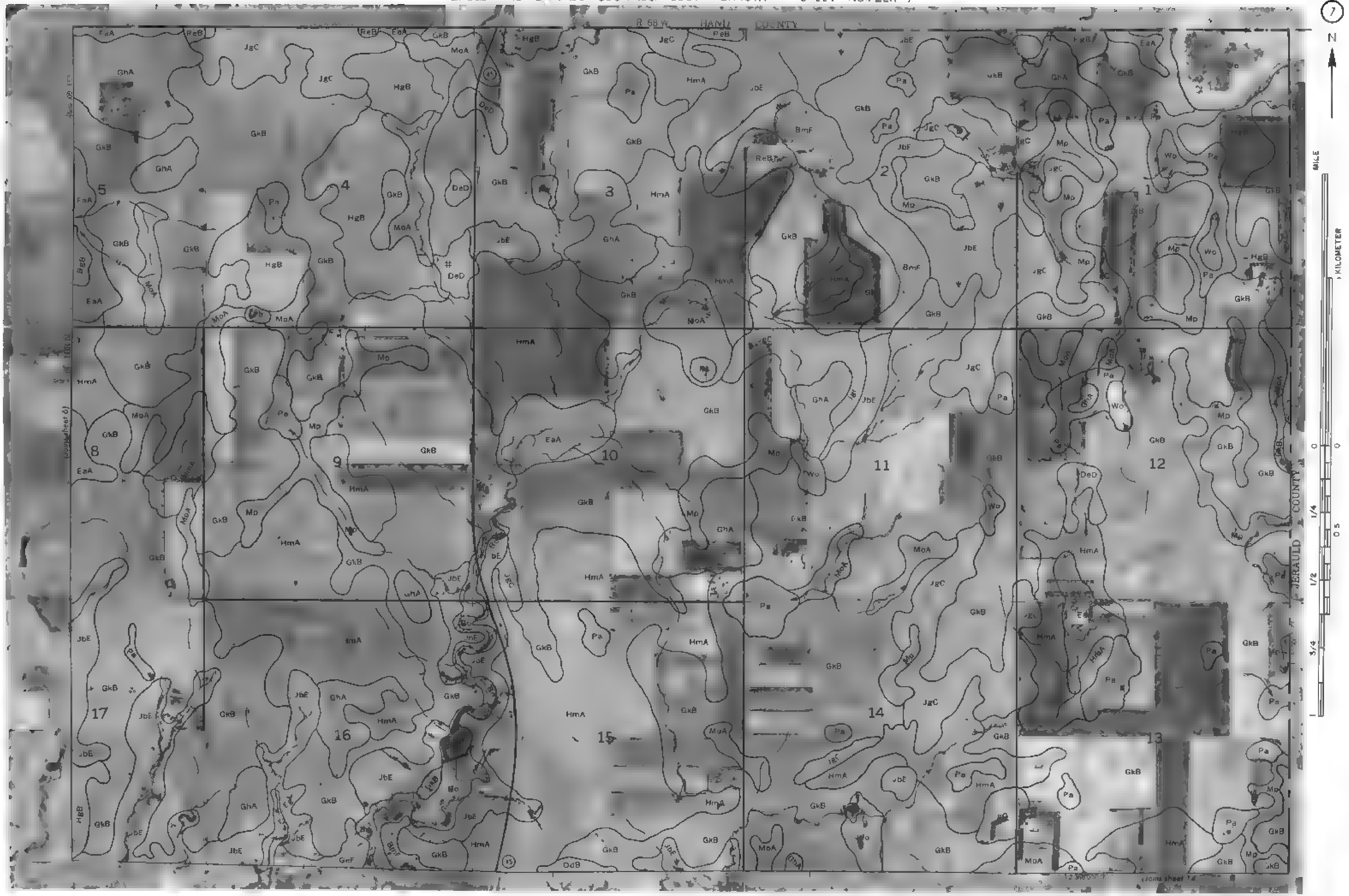
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 5

This map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

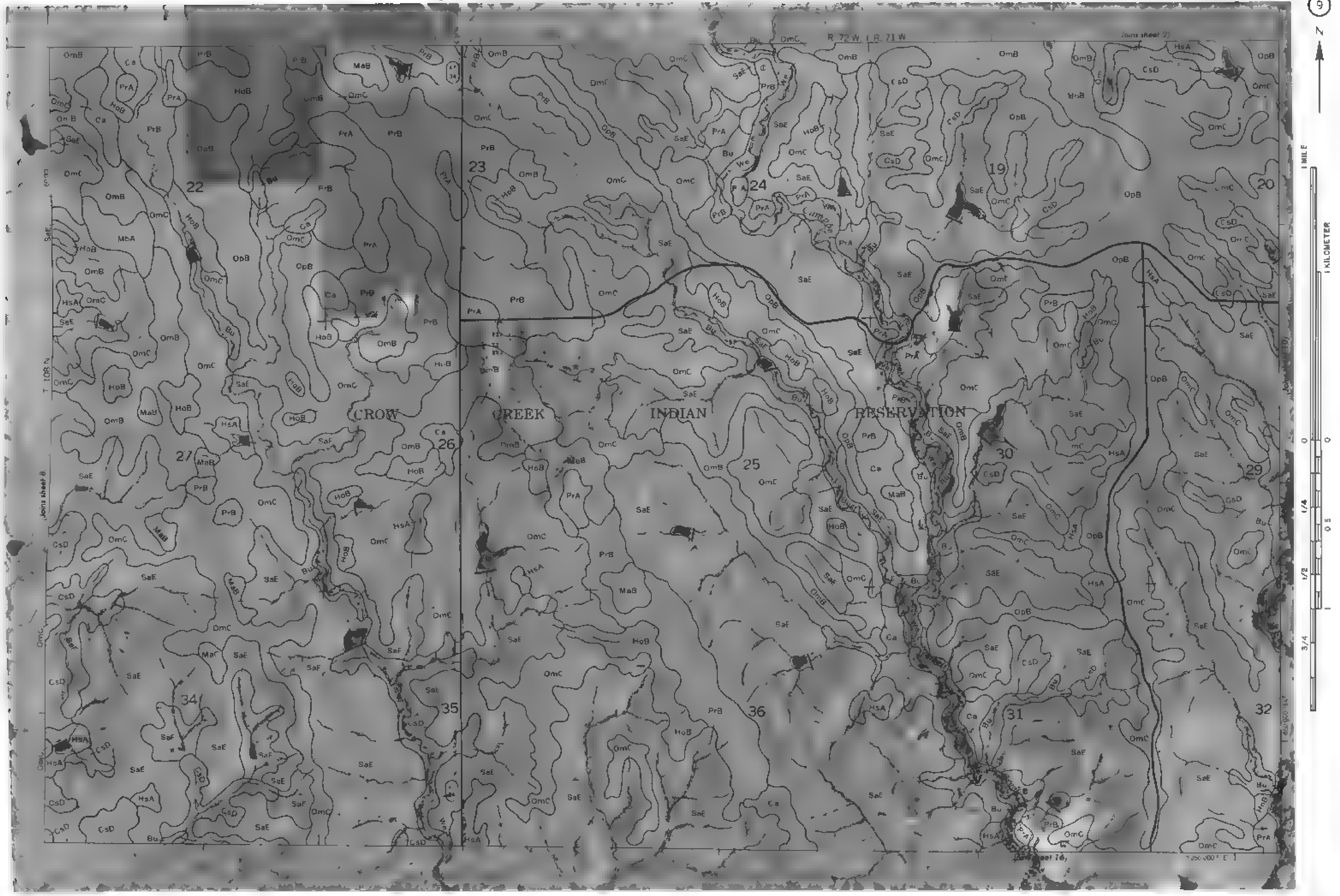
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA — SHEET NUMBER 6



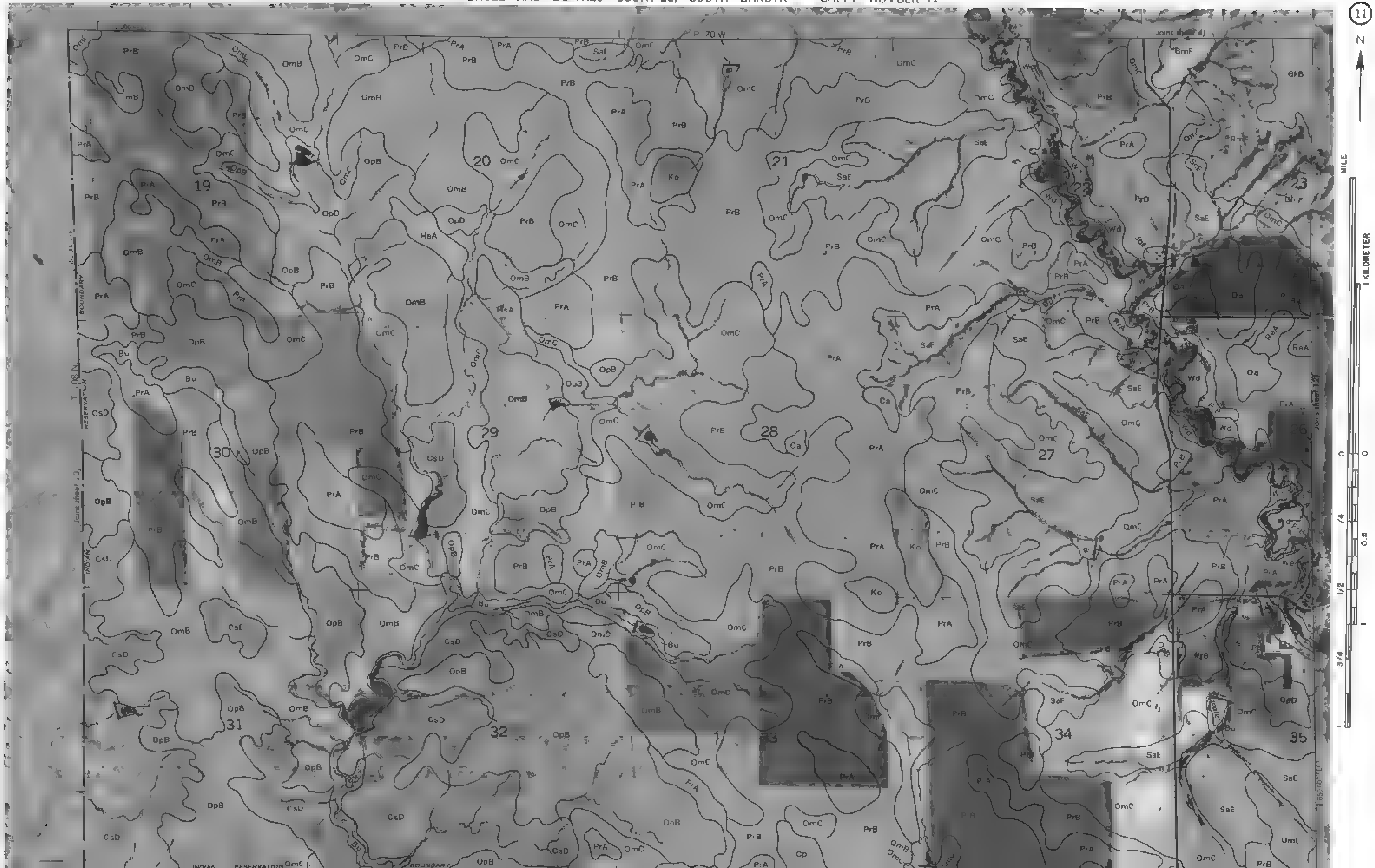
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 6


7
N
R. 68 W.
HAND COUNTY
JERAULD COUNTY
1
2
3
4
5
8
9
10
11
12
13
14
15
16
17
MILE
0
1/4
1/2
3/4
1
KILOMETER
0.5
Scale 1:20 000
(Joins sheet 14)
(Joins sheet 6)
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 7

BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 8

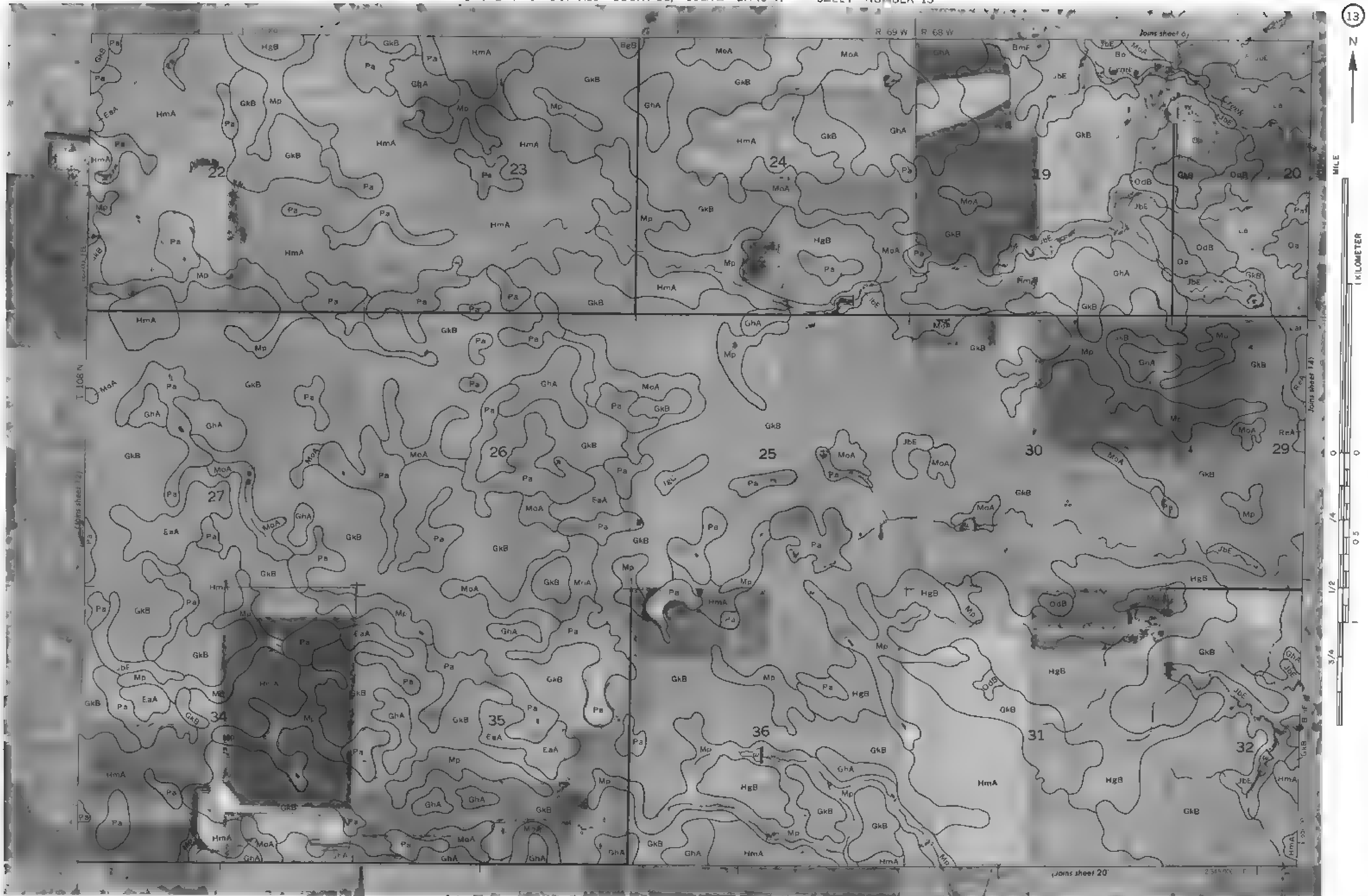

9
N
R. 72 W. | R. 71 W.
T. 108 N.
Joins sheet 8
CROW CREEK INDIAN RESERVATION
19
20
22
23
24
25
26
27
29
30
31
32
34
35
36
1 MILE
1 KILOMETER
Scale 1:20 000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 9


10
CROW CREEK INDIAN RESERVATION
21
22
23
24
20
29
28
27
26
25
32
33
34
35
36
Scale 1:20000
MILE
KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
T. 108 N.
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 10

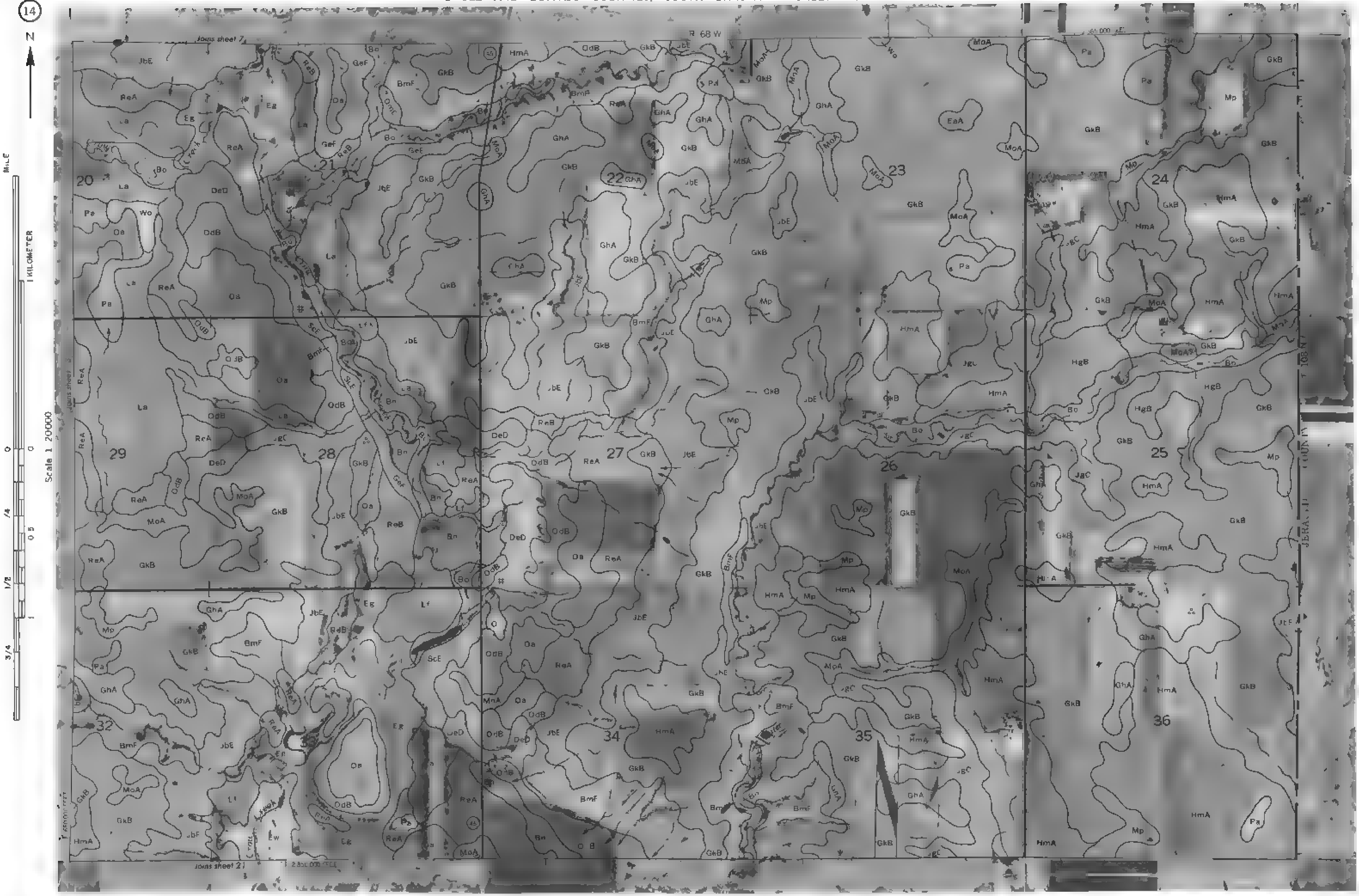


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 11


N
(Joins sheet 5)
R. 70 W.
R. 69 W.
1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
0
0.5
(Joins sheet 11)
(Joins sheet 13)
108 N.
19
20
23
24
25
26
28
29
30
31
32
33
35
36
GkB
EaA
HmA
MoA
Mp
Pa
BmF
GhA
OmC
ReA
PrA
SaE
Wa

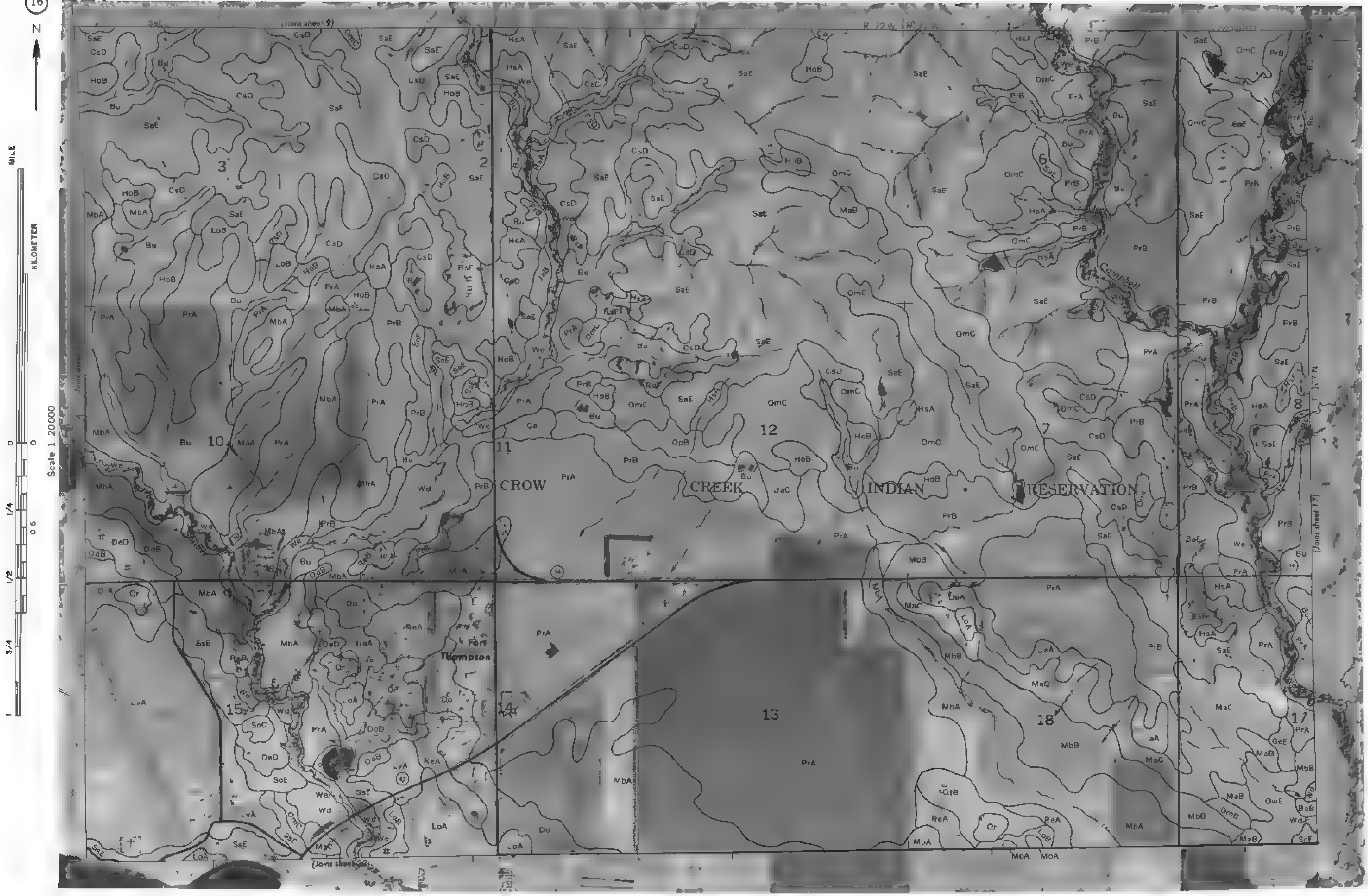

13
N
R 69 W
R 68 W
T 108 N
22
23
24
19
20
26
25
30
29
27
34
35
36
31
32
Joins sheet 20
1 MILE
1 KILOMETER
Scale 1:20 000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 13

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 14

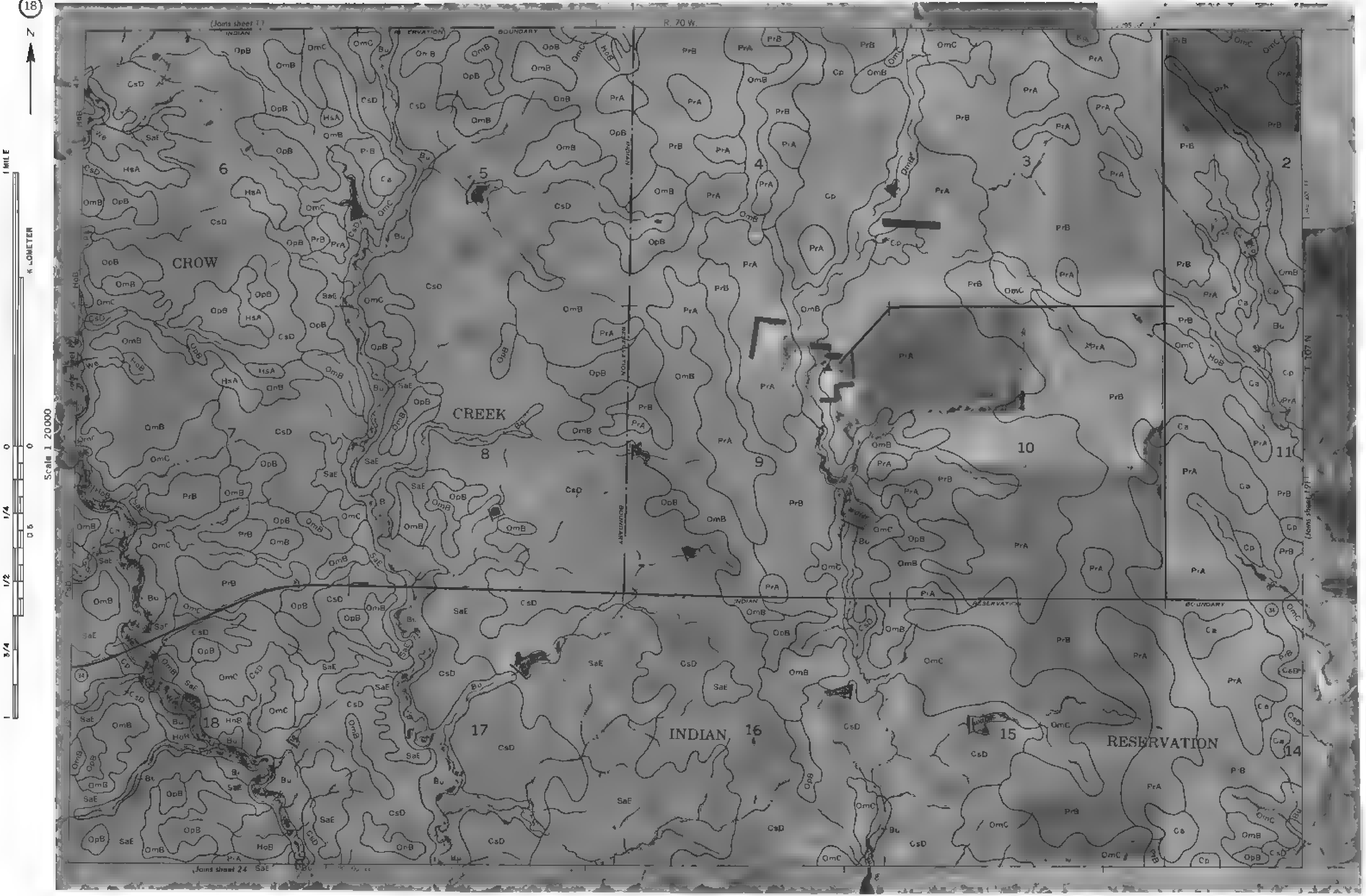


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 15

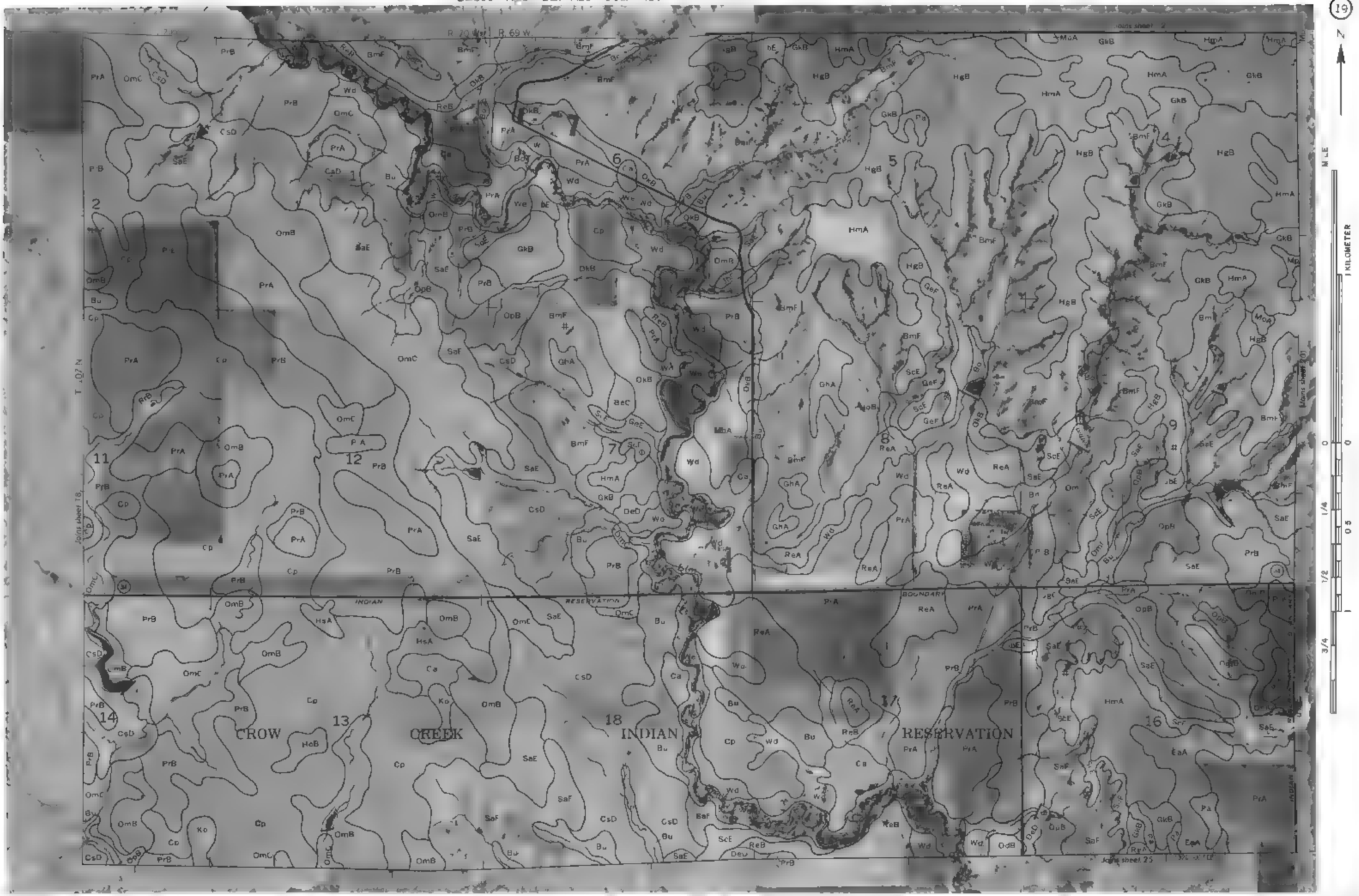
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 16



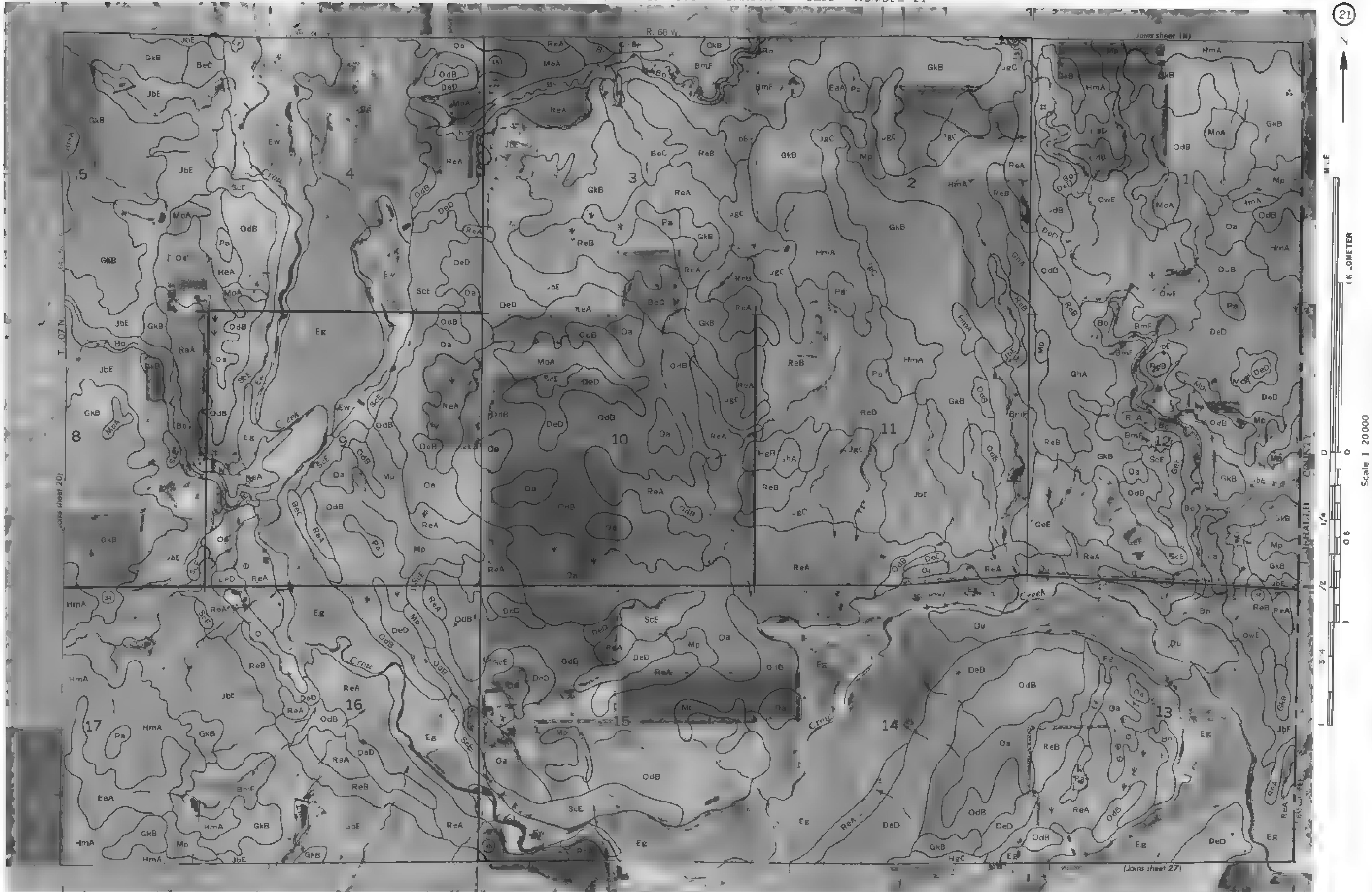
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO. 17


N
1 MILE
1 KILOMETER
Scale 1:20 000
(Joins sheet 17)
R. 70 W.
INDIAN RESERVATION BOUNDARY
CROW
CREEK
INDIAN
RESERVATION
T. 107 N.
(Joins sheet 19)
(Joins sheet 24)

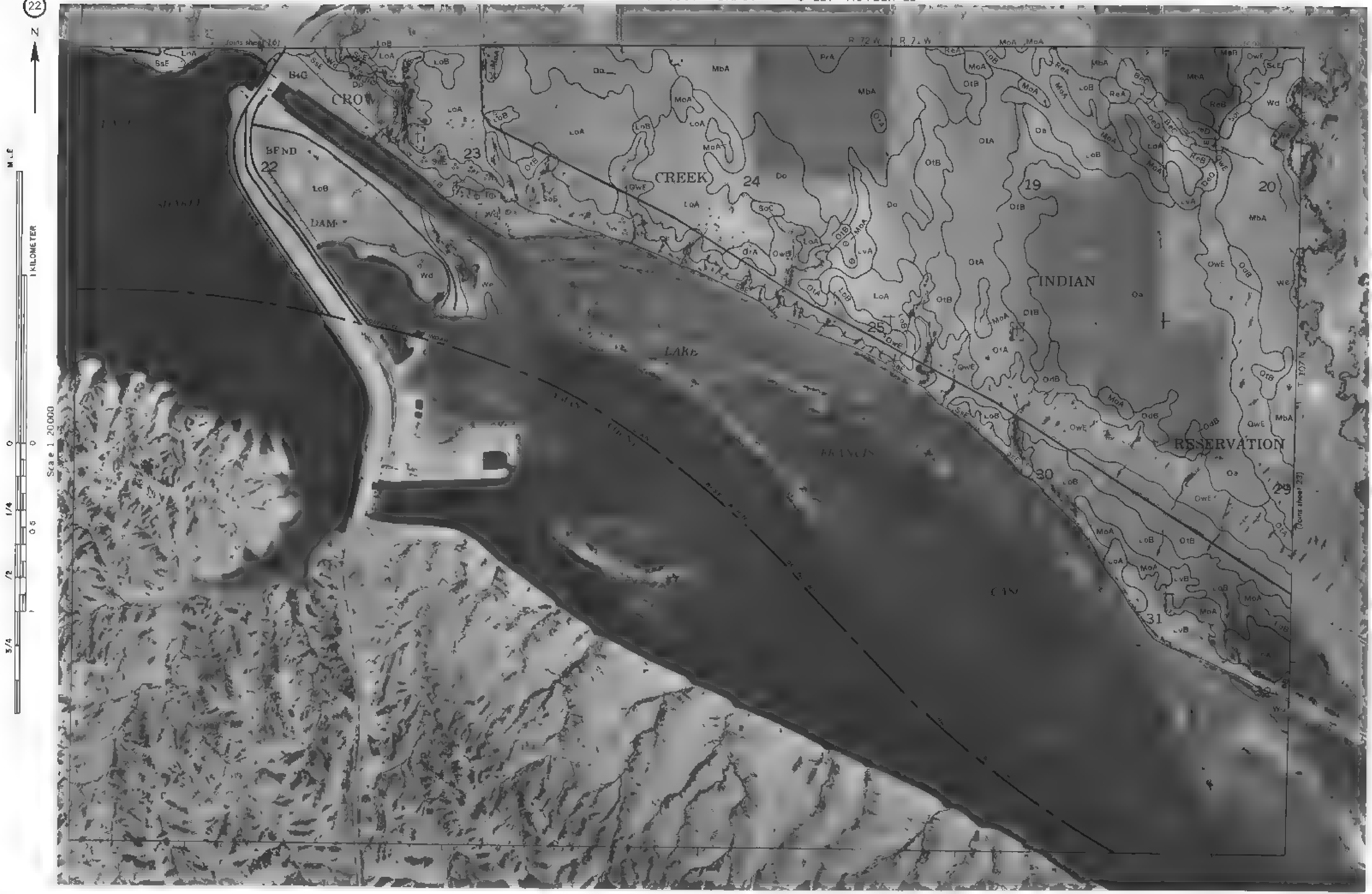
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 19




N
1 MILE
KILOMETER
Scale 1:20000
(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 26)
R. 69 W. | R. 68 W.
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 20

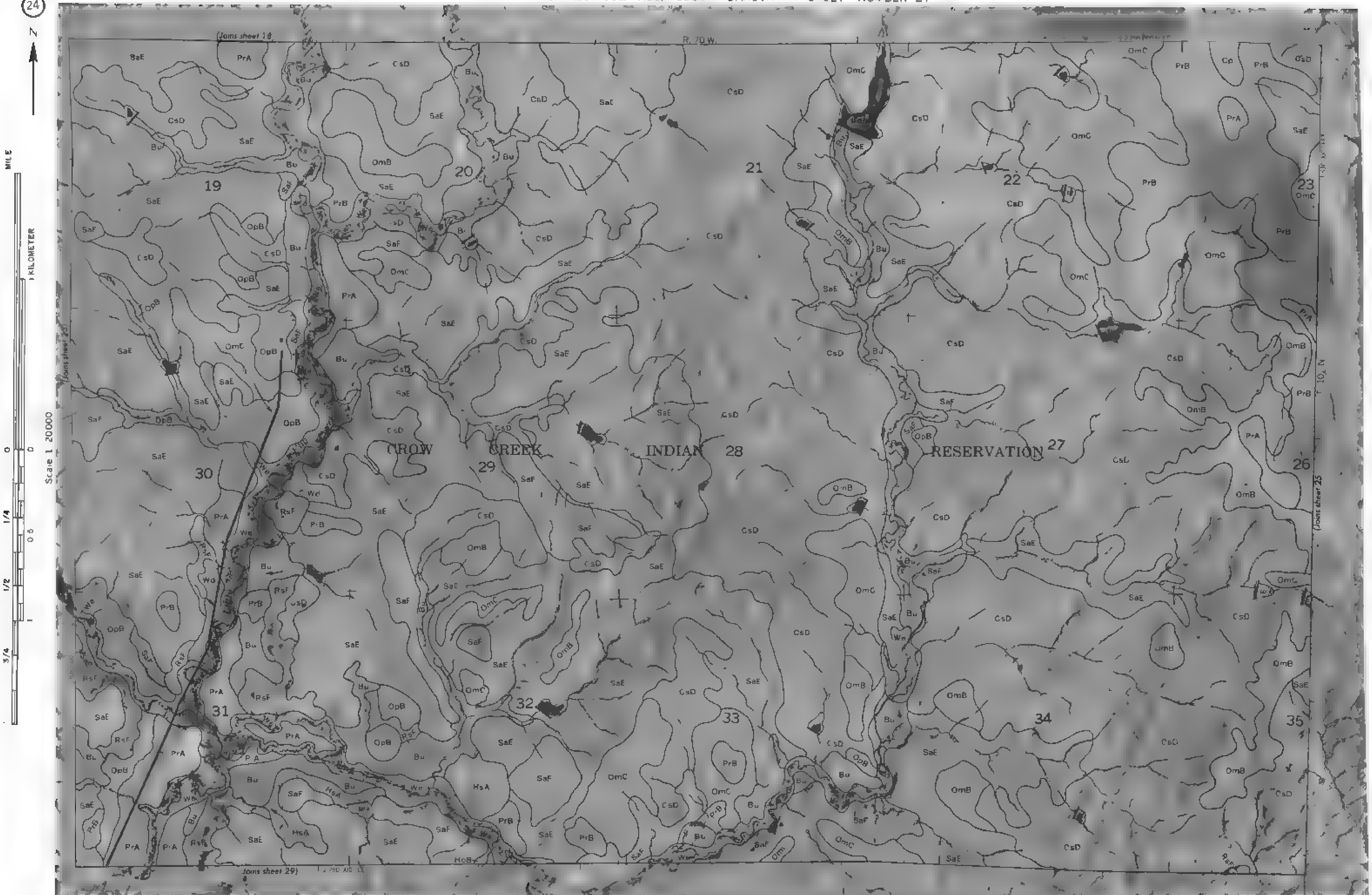


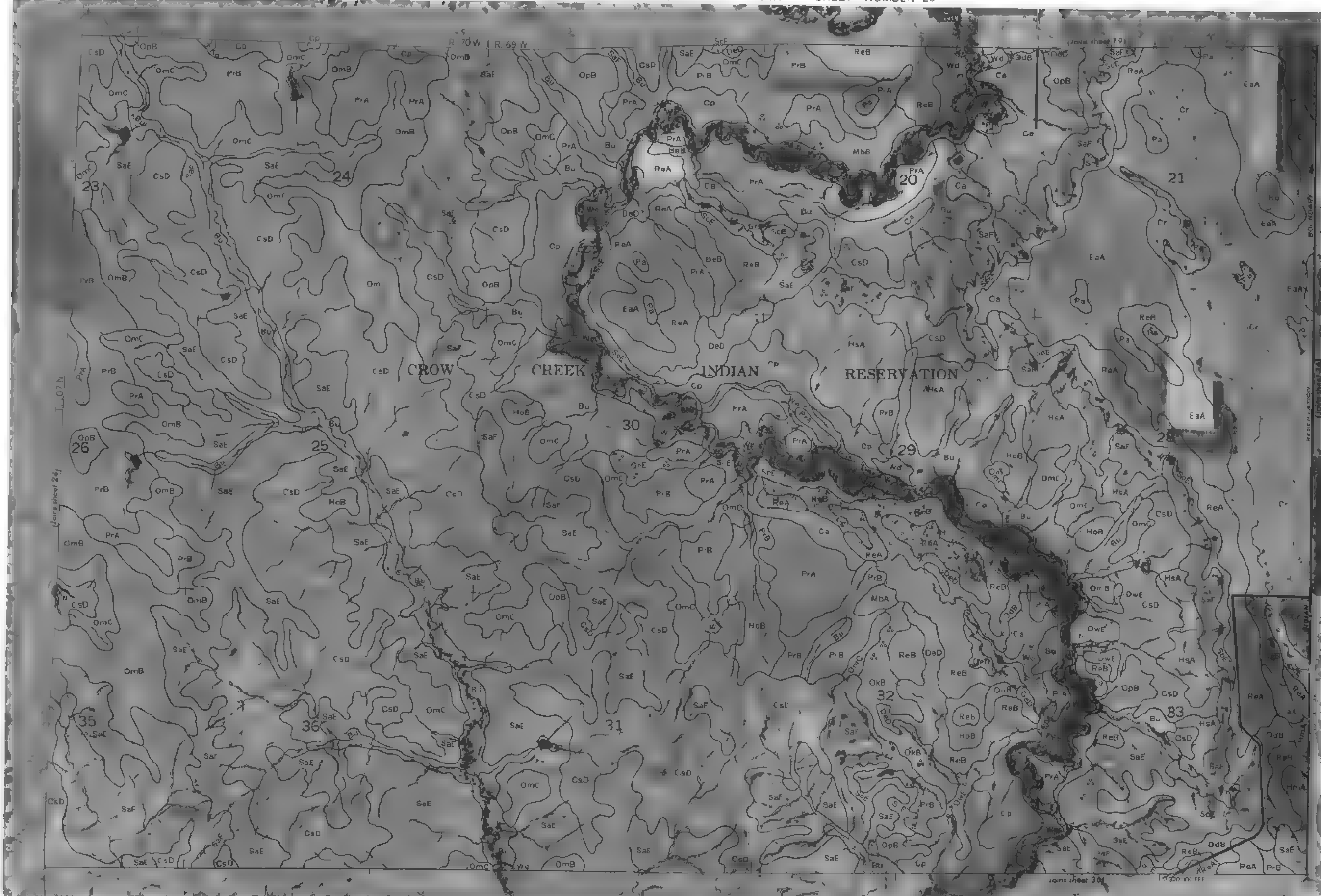
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 21



22
N
MILE
1 KILOMETER
Scale 1 20000
0
1/4
1/2
3/4
0
0.5
1
CROW
CREEK
INDIAN
RESERVATION
BEND
DAM
LAKE
22
23
24
25
19
20
29
30
31
R 72 W
R 71 W
T 107 N
(Joins sheet 16)
(Joins sheet 23)
LoA
LoB
SsE
BsG
MoA
MbA
Do
OtA
OtB
OwE
Wd
We
ReA
ReB
DeD
PrA
LvA
LvB
SoC

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 23

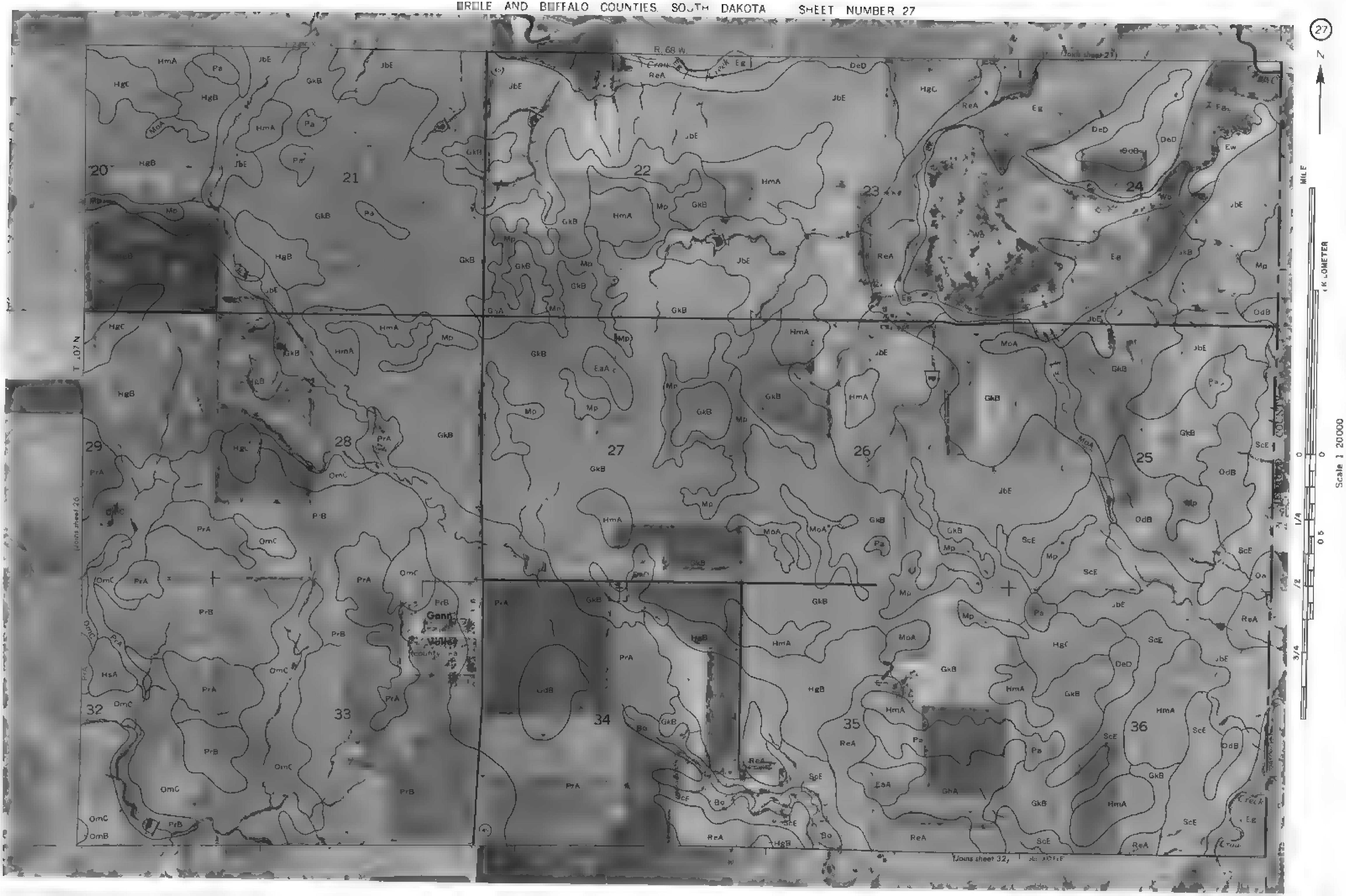

N
MILE
KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 18)
R. 70 W.
(Joins sheet 20)
(Joins sheet 25)
(Joins sheet 29)
CROW CREEK INDIAN RESERVATION
19
20
21
22
23
26
27
28
29
30
31
32
33
34
35
SaE
PrA
CsD
Bu
OmB
OmC
OpB
PrB
SaF
RsF
Wa
HsA
CsD
OmC



N
1 MILE
1 KILOMETER
Scale 1:20000

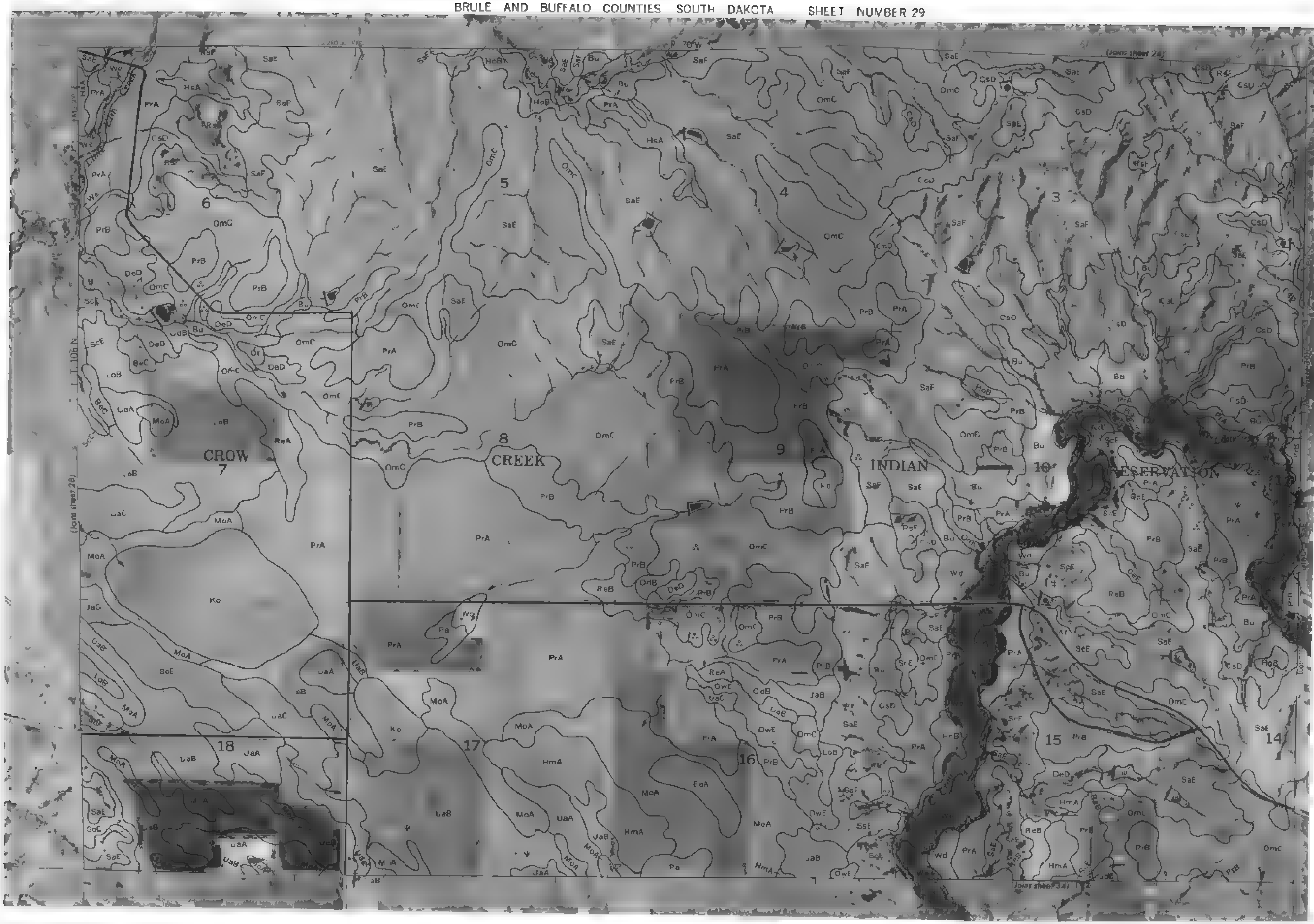
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 25

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 26

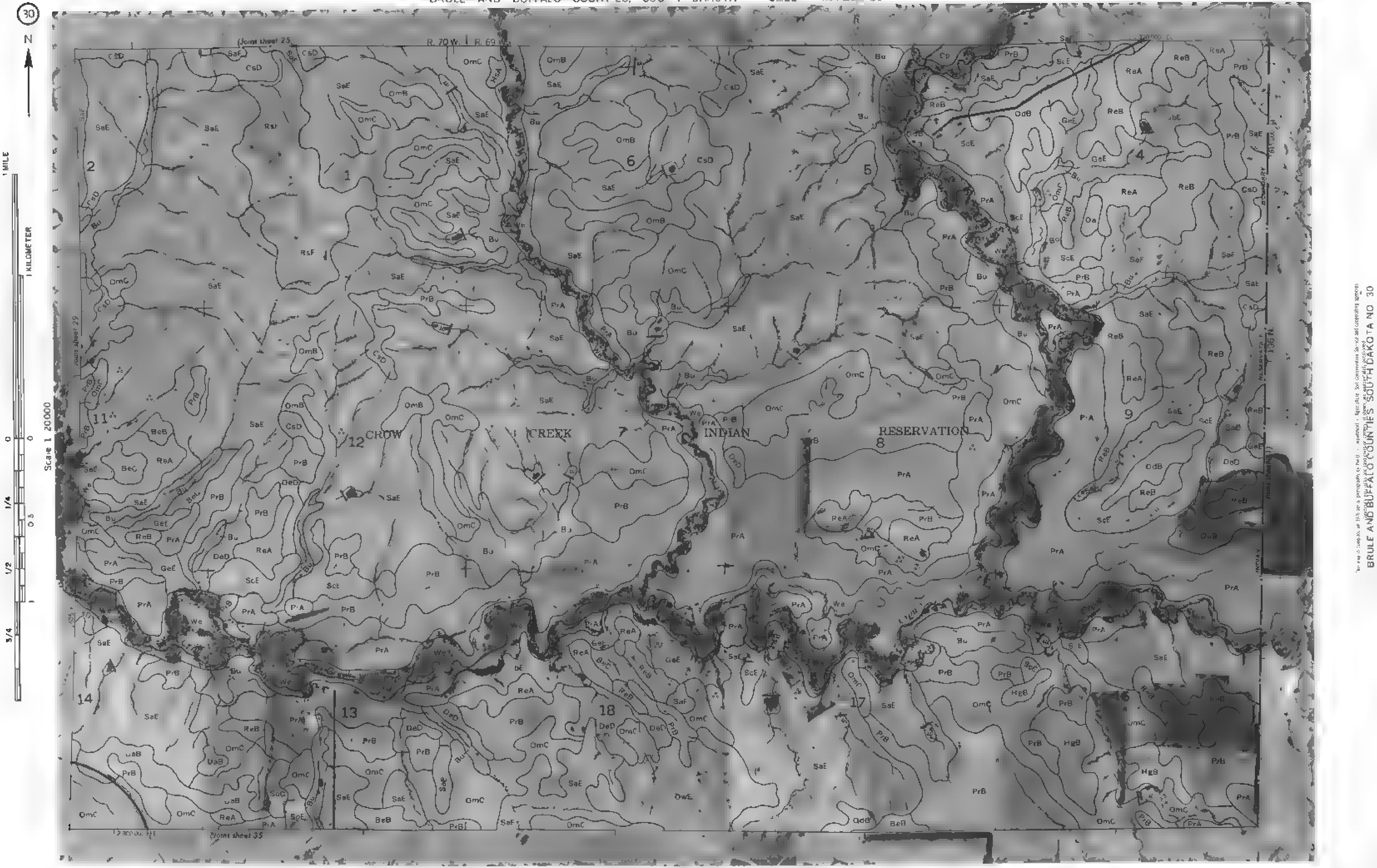


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 27

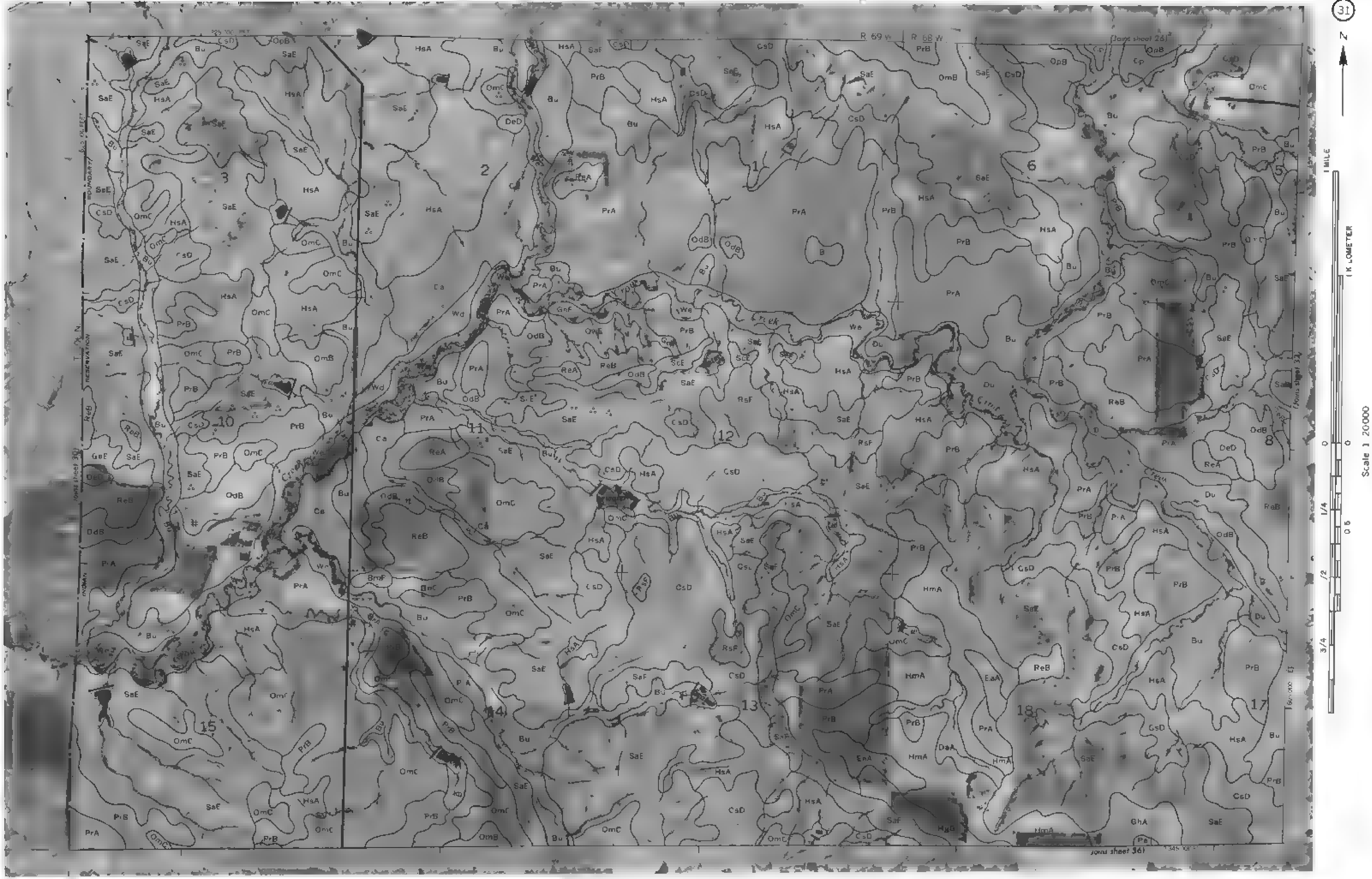

N
1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
Joins sheet 23
Joins sheet 29
CROW
CREEK
INDIAN
RESERVATION
106 N
LoB
LoA
MoA
LvB
SoE
SoC
SaE
SsE
UaA
UaB
OmC
OwE
PrA
PrB
ReA
OdB
Bo
Bu
Wd
Wa
water
1
2
3
4
10
11
12
13
14
15

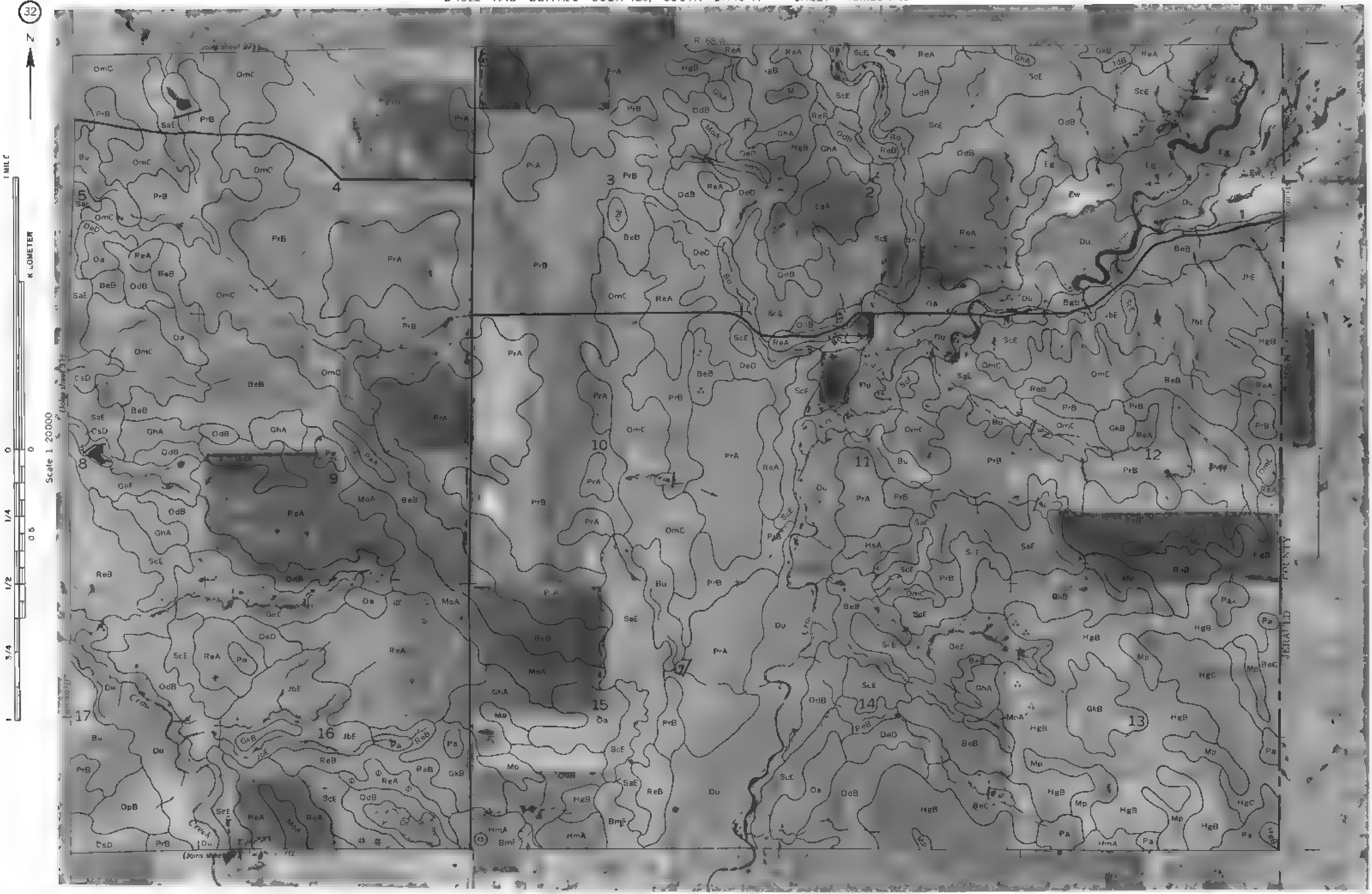


BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO. 29


30
N
Joins sheet 25
R. 70 W.
R. 69 W.
Joins sheet 29
Joins sheet 35
CROW
CREEK
INDIAN
RESERVATION
1 MILE
1 KILOMETER
Scale 1:20000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 30

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 31

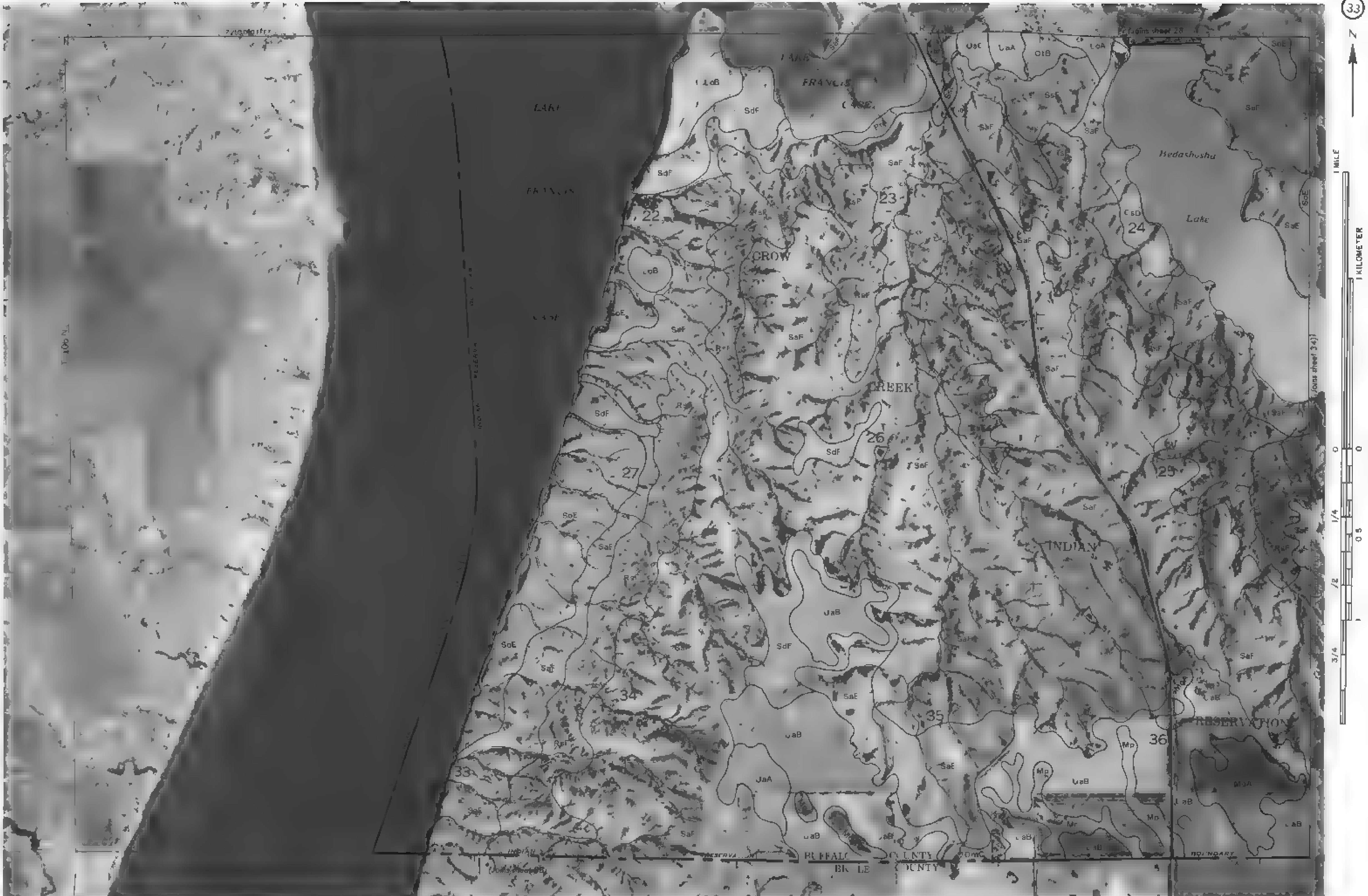


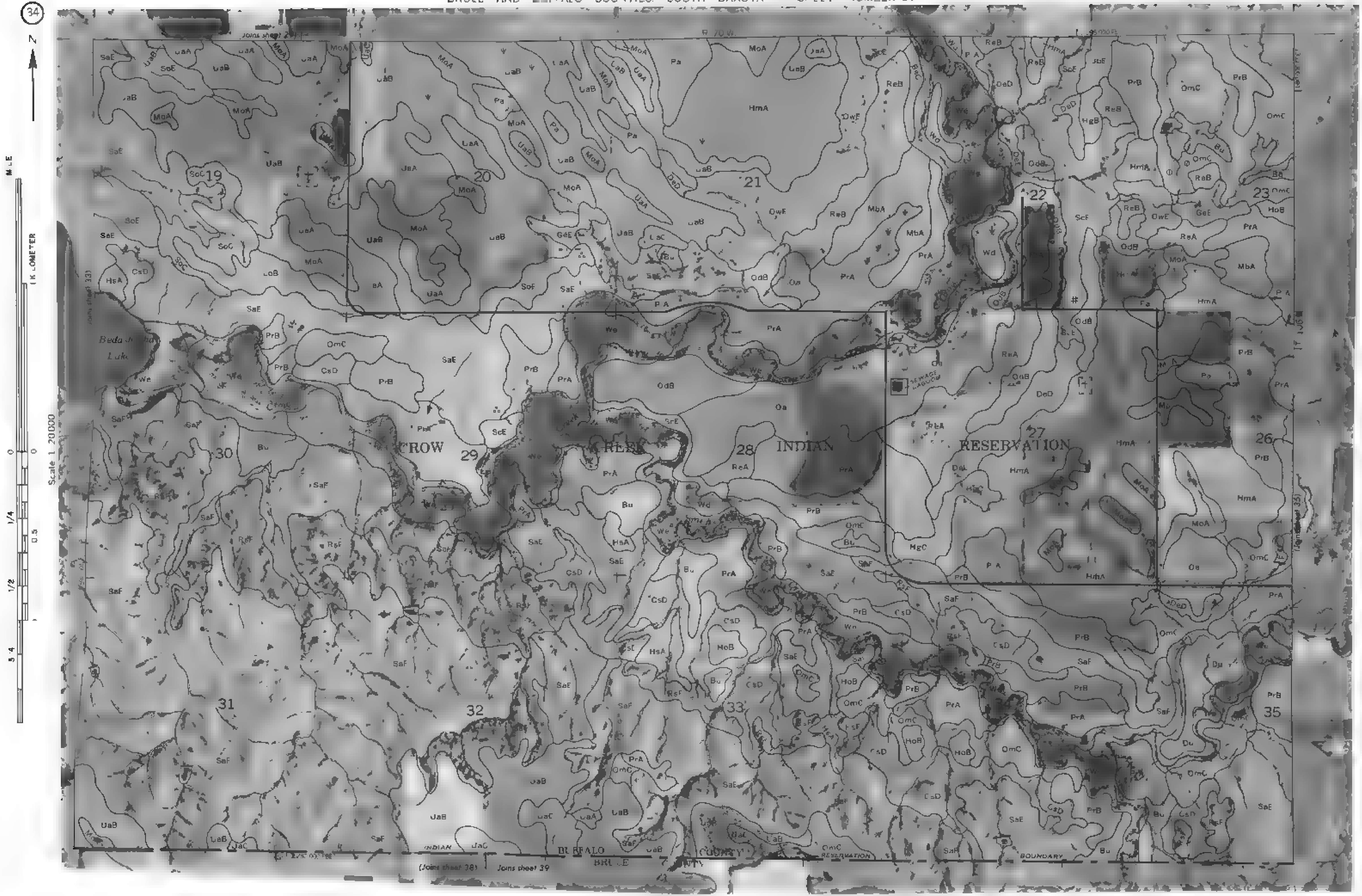


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 32

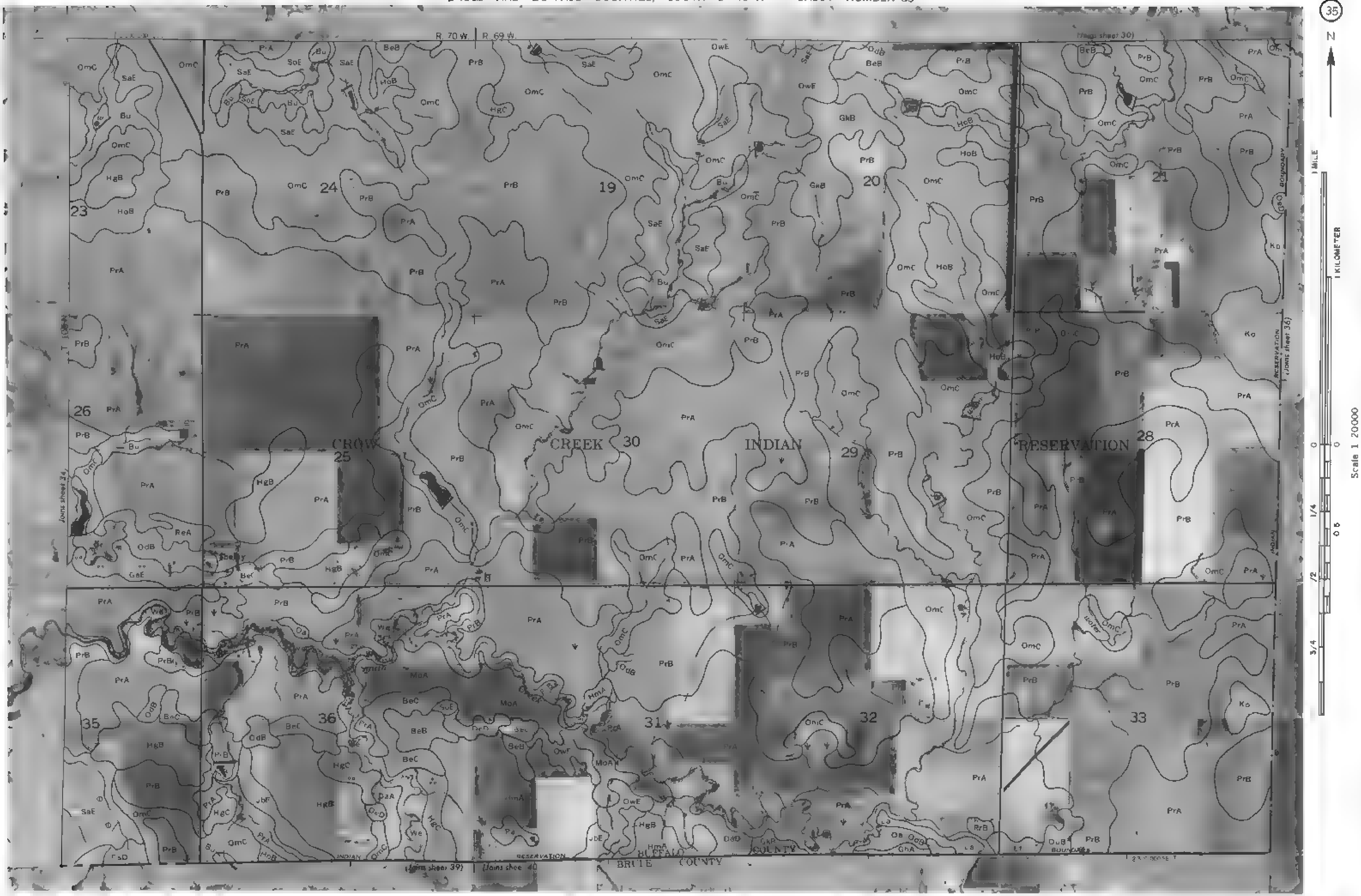
33

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 33



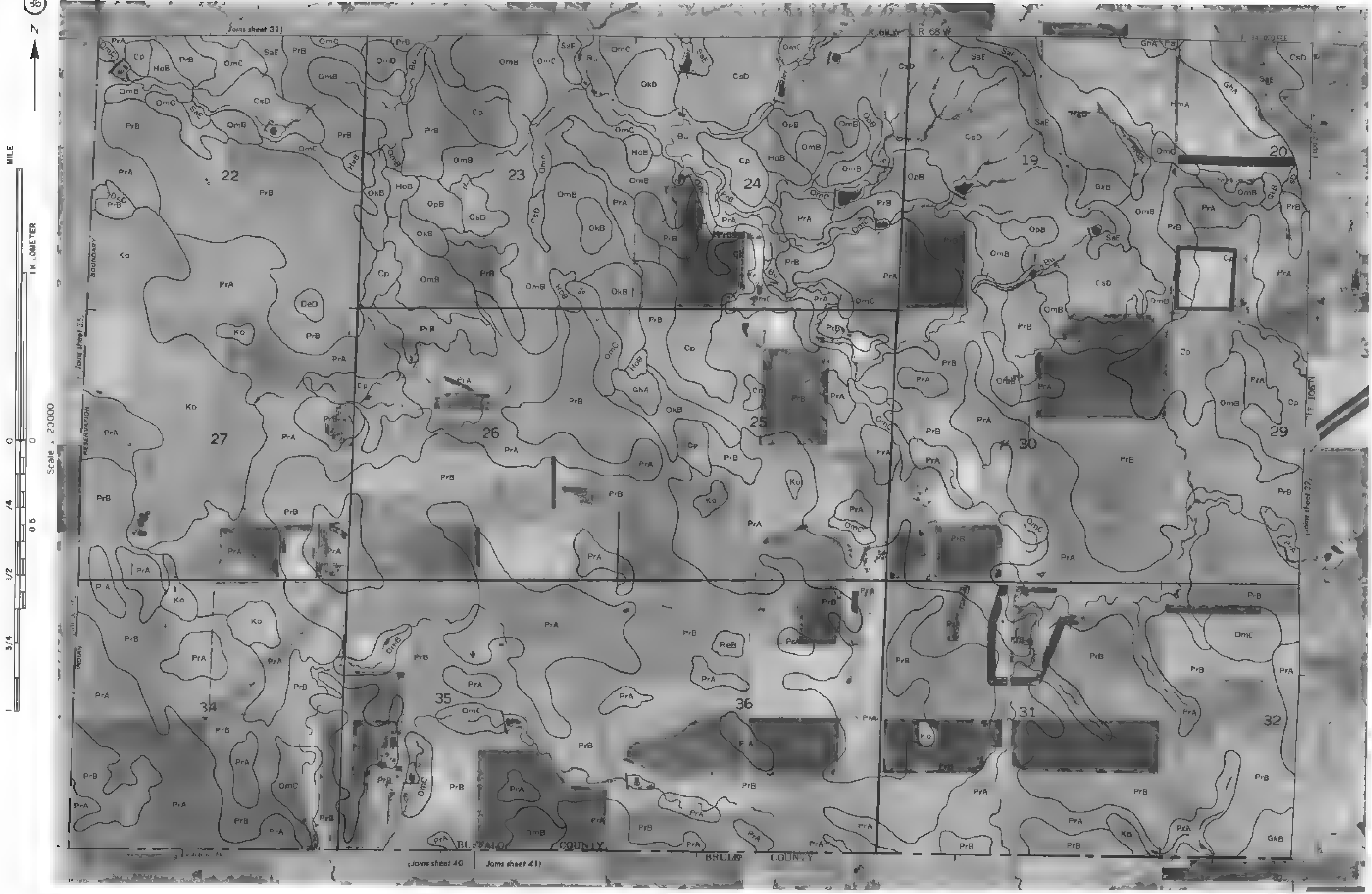


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 34



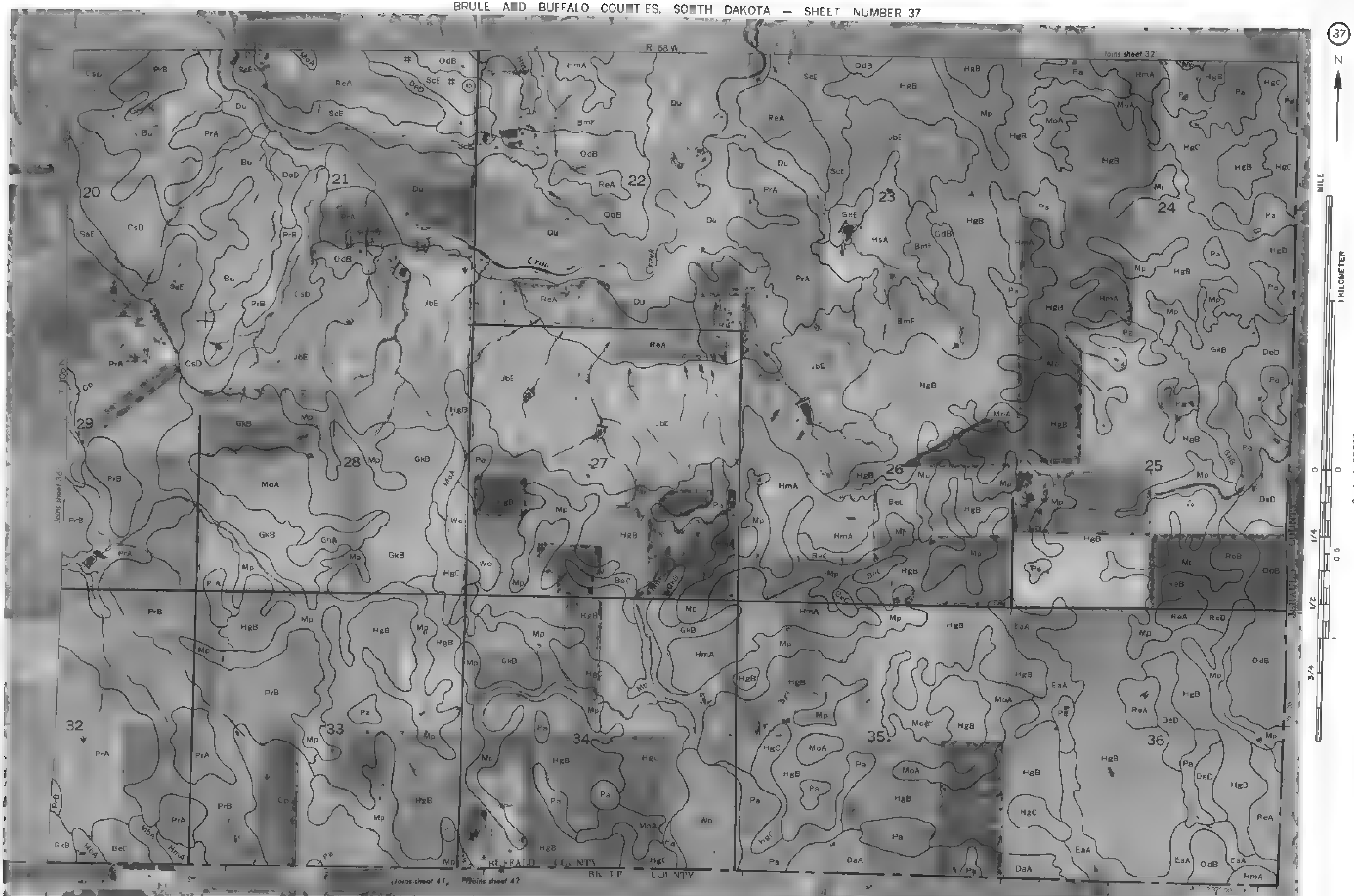
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 35

36

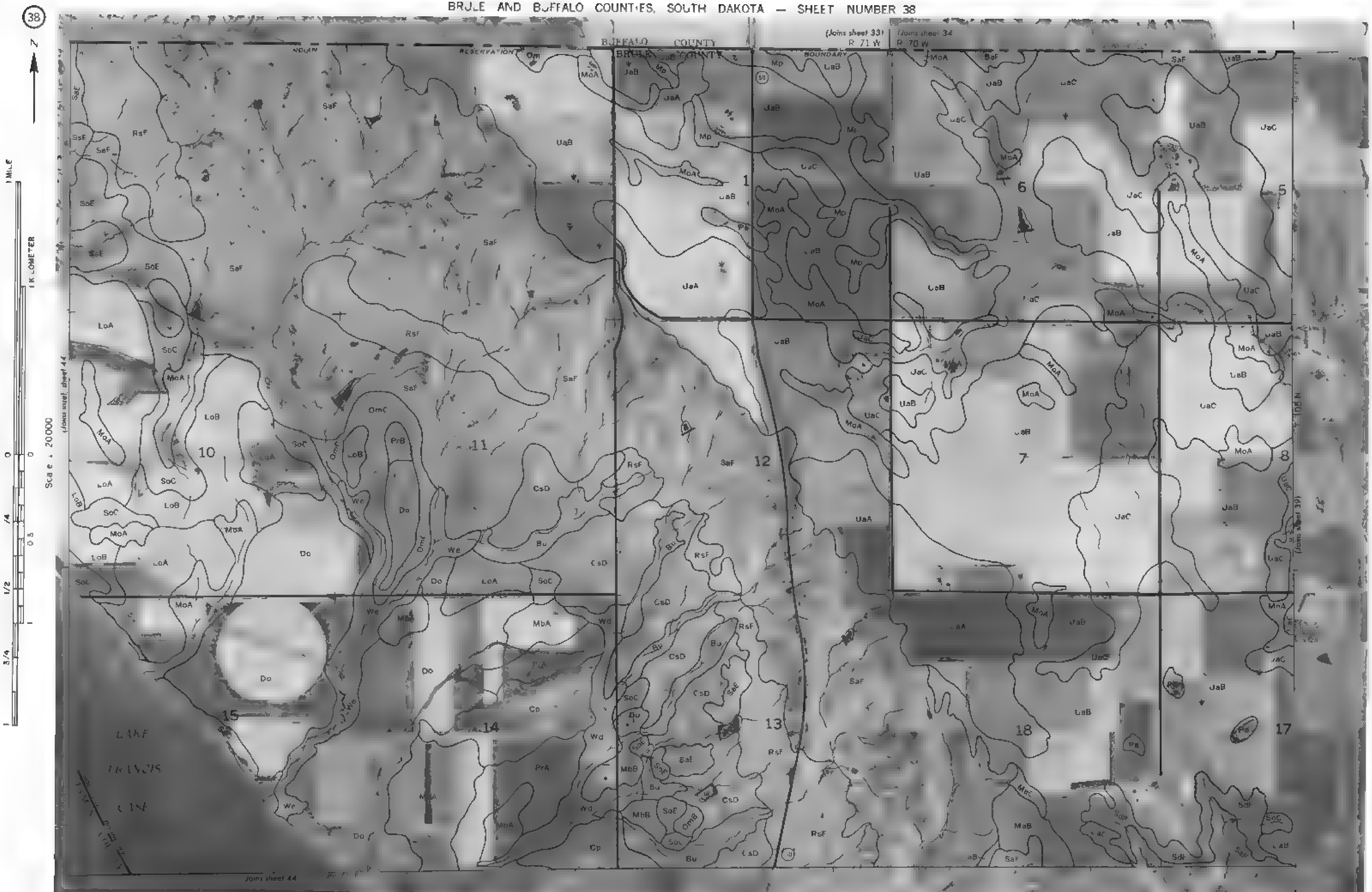


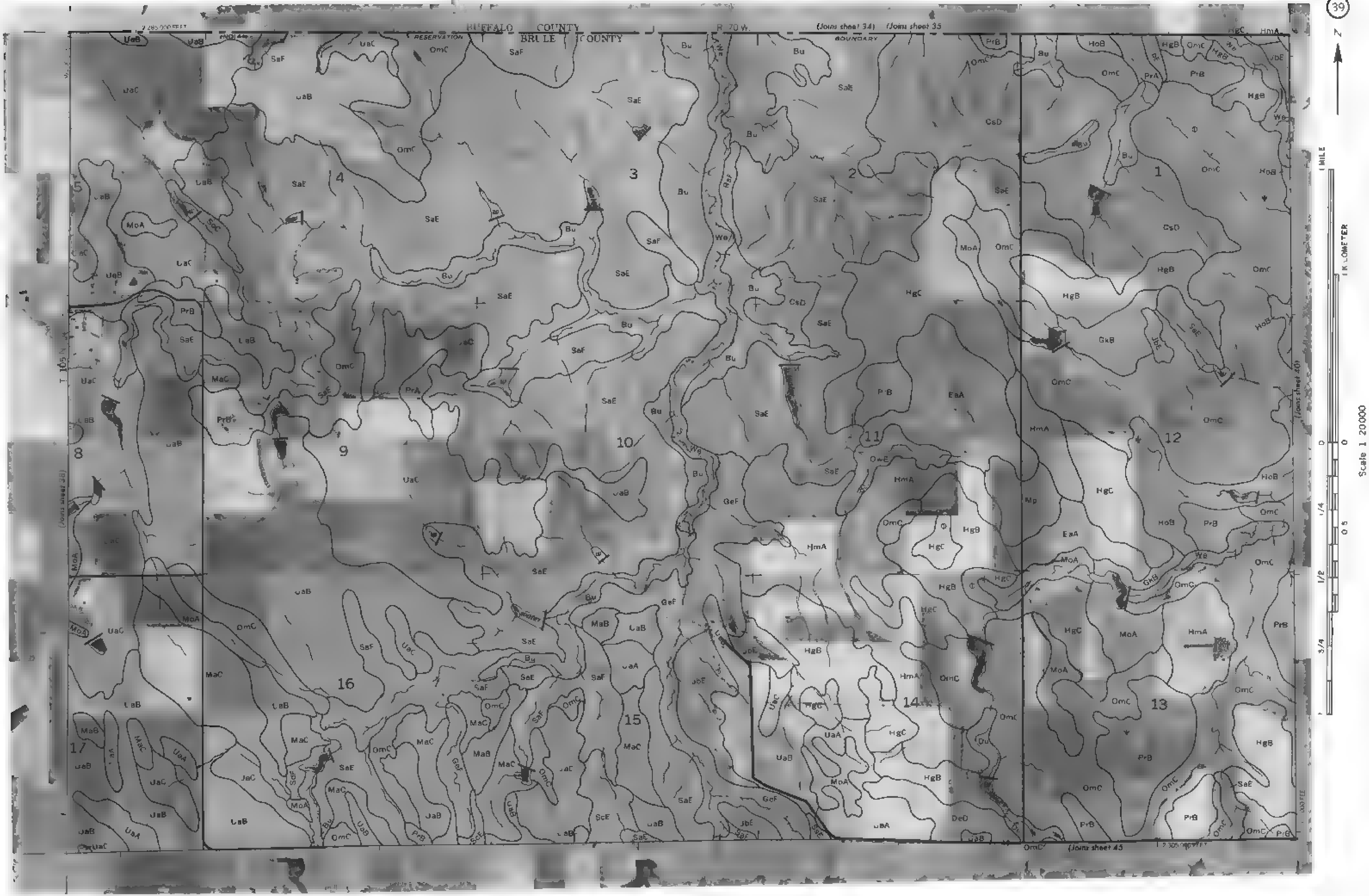
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 36

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 37



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 37


38
N
1 MILE
1 KILOMETER
Scale 1:20 000
BUFFALO COUNTY
BRULE COUNTY
(Joins sheet 33)
R. 71 W.
(Joins sheet 34)
R. 70 W.
(Joins sheet 44)
(Joins sheet 39)
Joins sheet 44
T. 105 N.
LAKE FRANCIS CASE
1
2
5
6
7
8
10
11
12
13
14
15
17
18



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 39

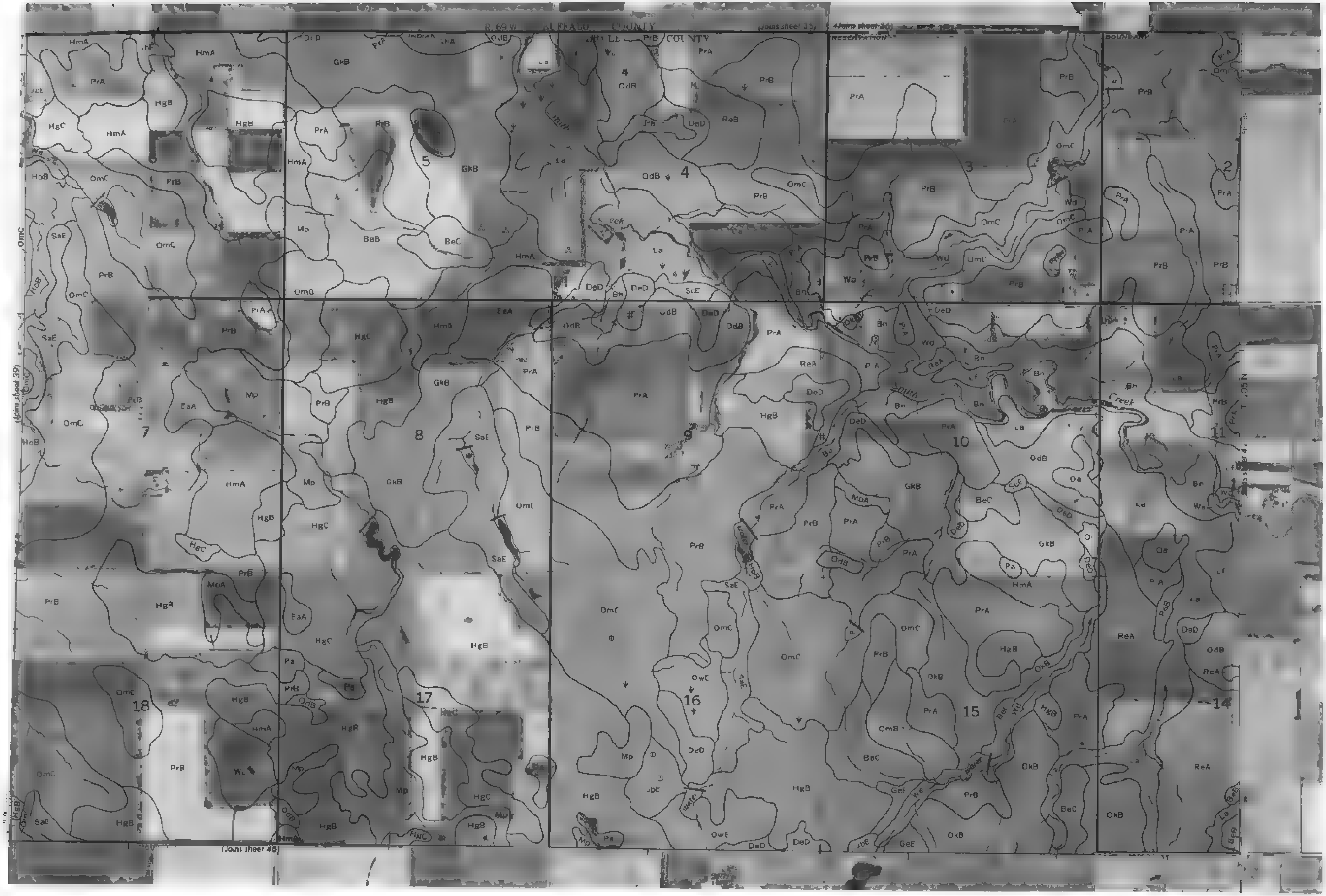
40

N

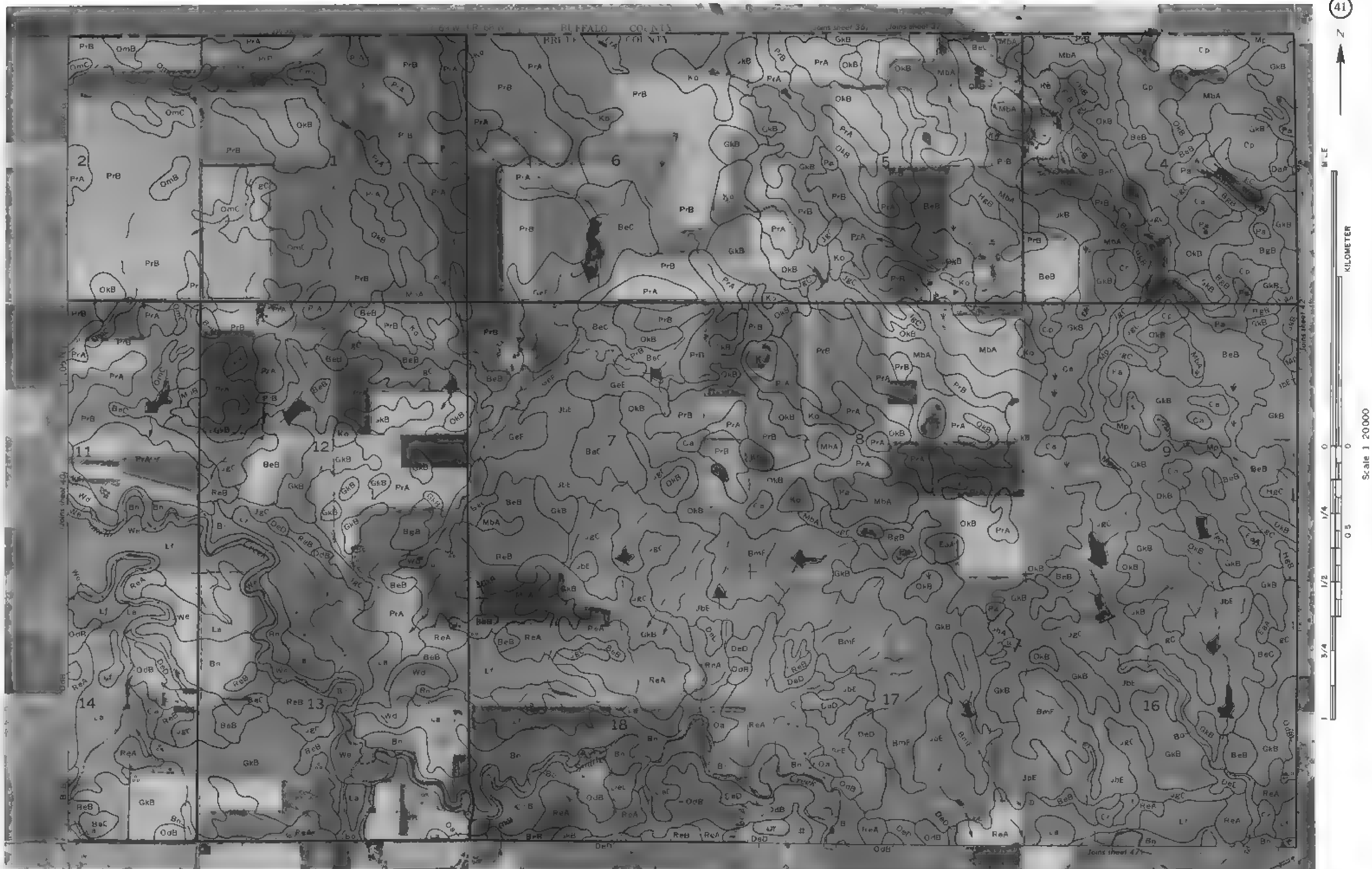
1 MILE

1 KILOMETER

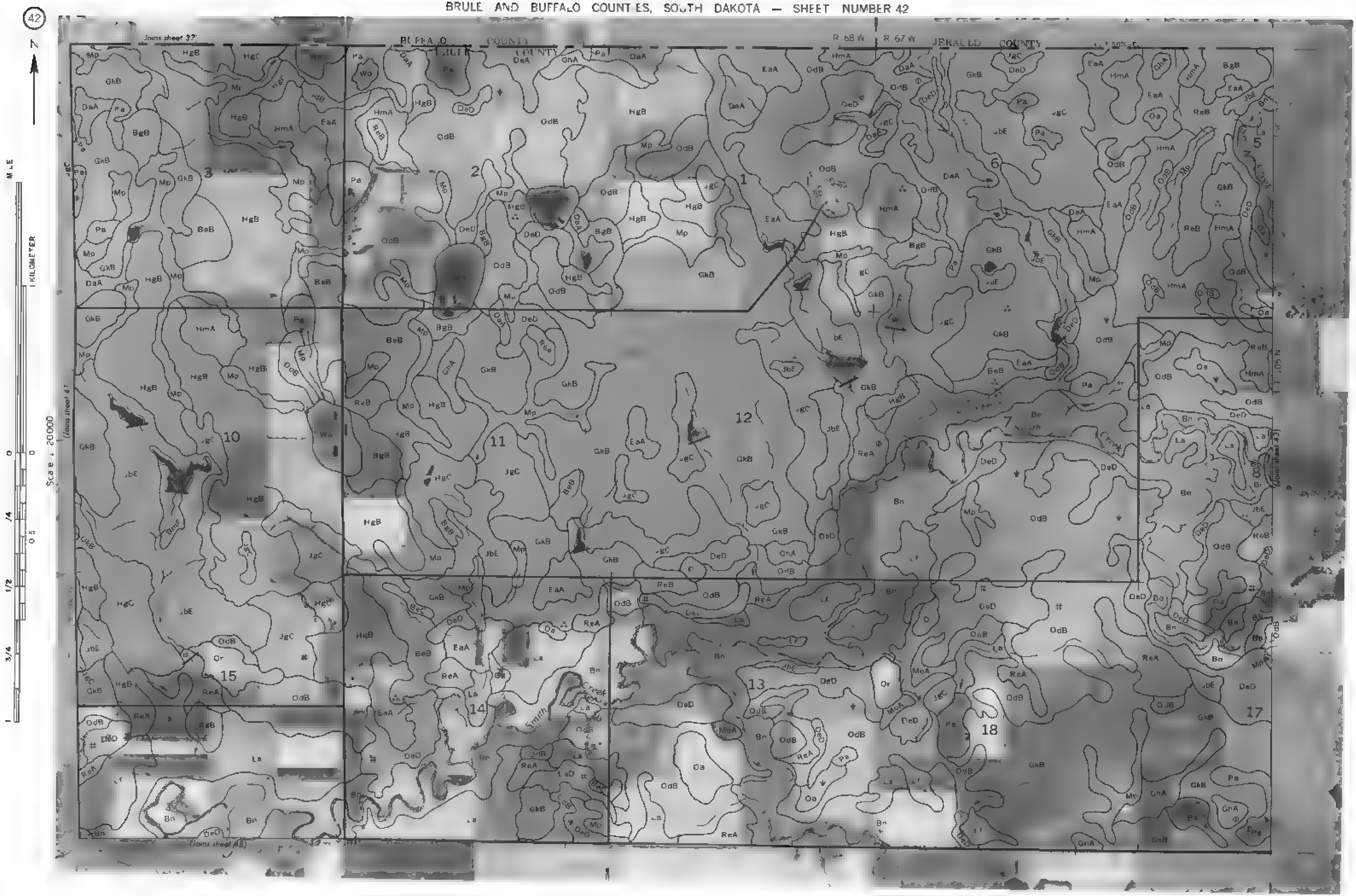
Scale 1:20000

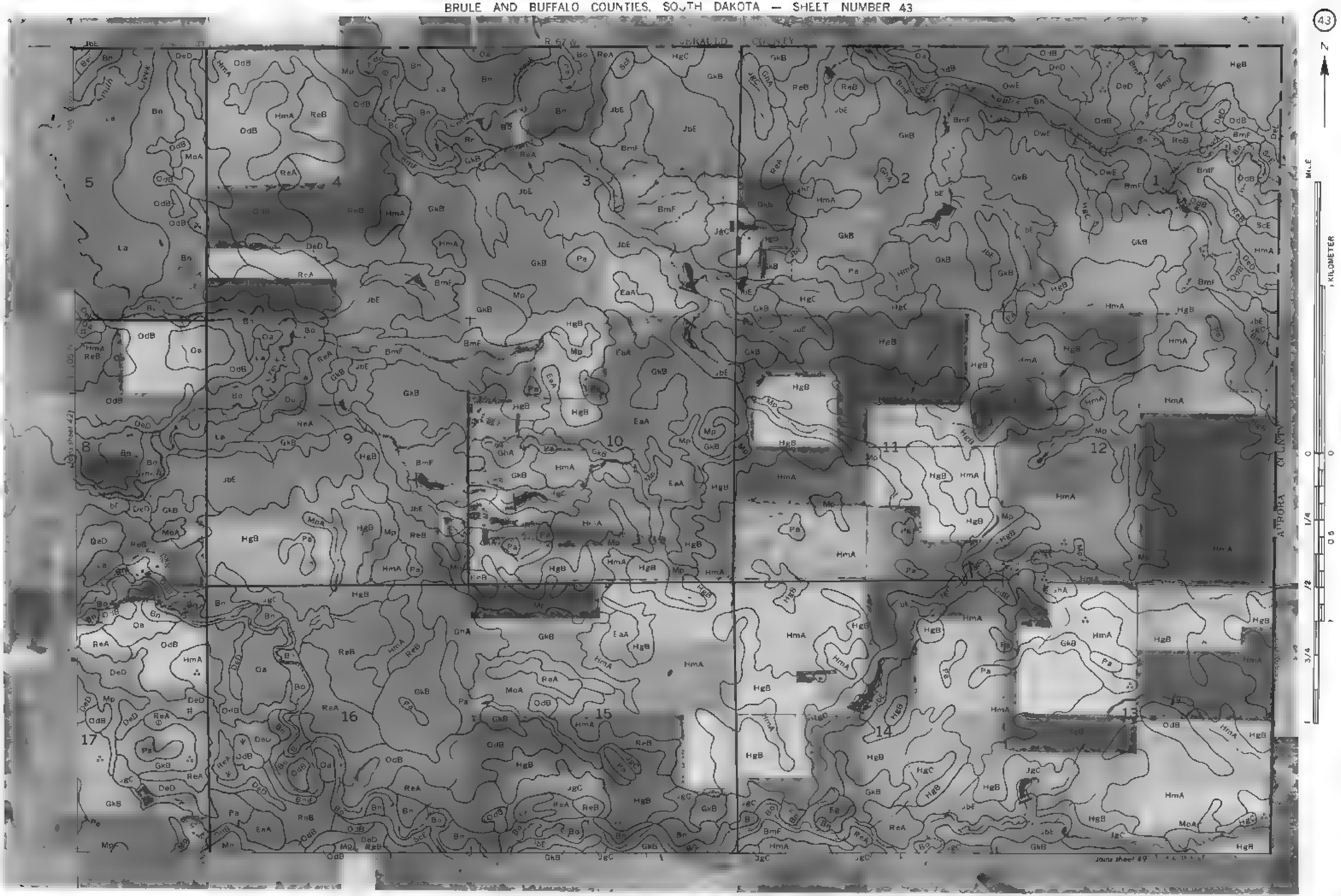


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 40


41
N
BUFFALO COUNTY
BRULE COUNTY
Joins sheet 36
Joins sheet 37
Joins sheet 42
Joins sheet 47
Joins sheet 40
Crow Creek
MILE
KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0.5
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 41

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 42



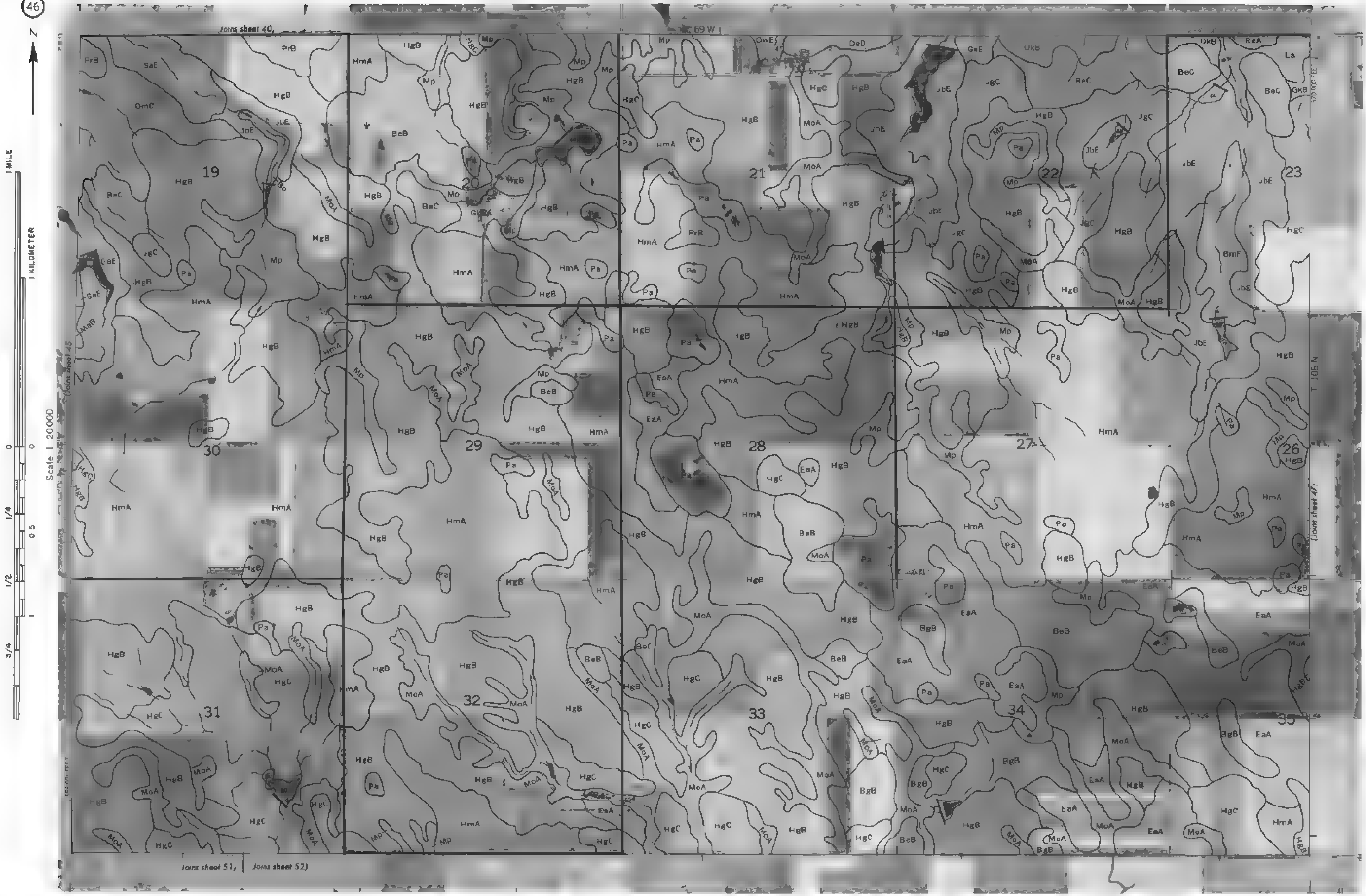


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 43

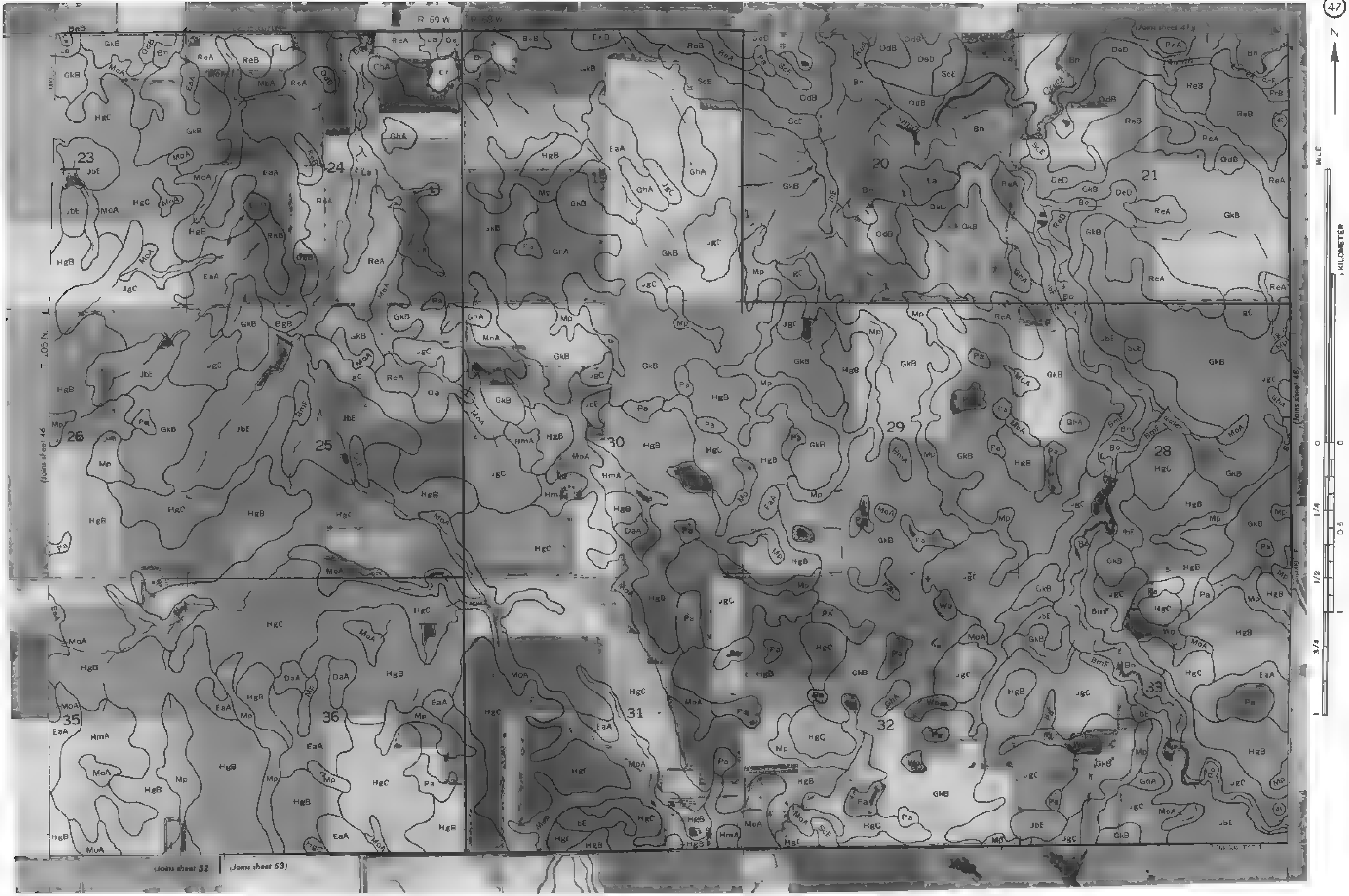

44
N
1 MILE
1 KILOMETER
Scale 1:20 000
0
1/4
1/2
3/4
1
0
0.5
(Joins sheet 38)
BUFFALO COUNTY
BRULE COUNTY
LAKE
FRANCIS
CASE
LYMAN COUNTY
INDEFINITE BOUNDARY
LYMAN
COUNTY
2 255 000 FEET
575 000 FEET
Lake Francis Case
Bachelor Gulch
Creek
23
24
25
36
19
20
30
29
31
32
4
9
Do
MbA
Wu
PrA
Cp
Bu
CsD
PrB
Wd
We
SaF
SoE
RsF
JaB
UaA
UaB
LoA
LoB
OmC
GeF
MaC
MoA
Pa
UaC
BmE
SoF
MaB
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 44

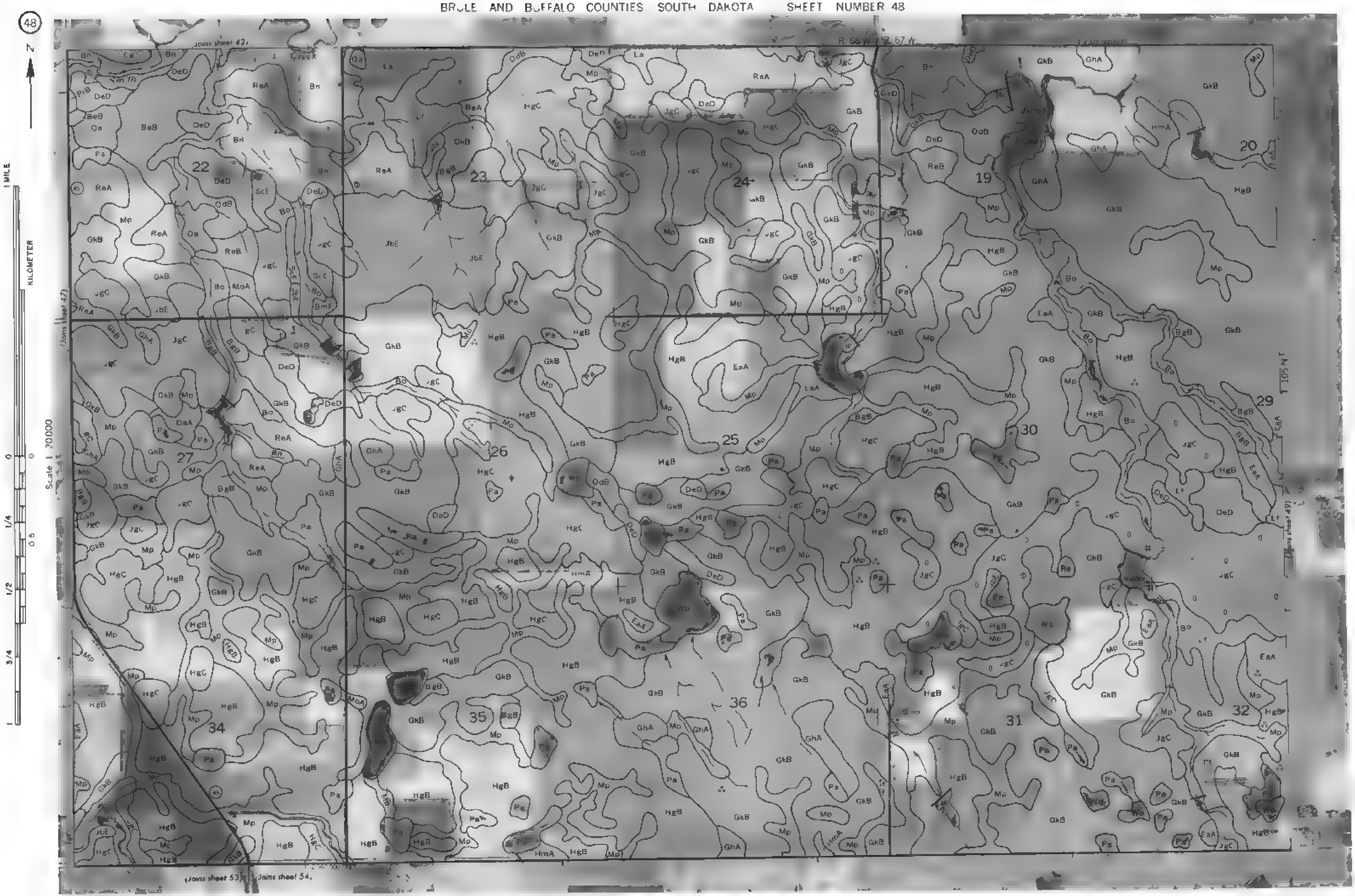

45
N
Joins sheet 39
Joins sheet 44
Joins sheet 46
Joins sheet 50
Joins sheet 51
R. 70 W.
Bad Hand
Tschudy Creek
Scale 1:20000
Mile
Kilometer
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 45

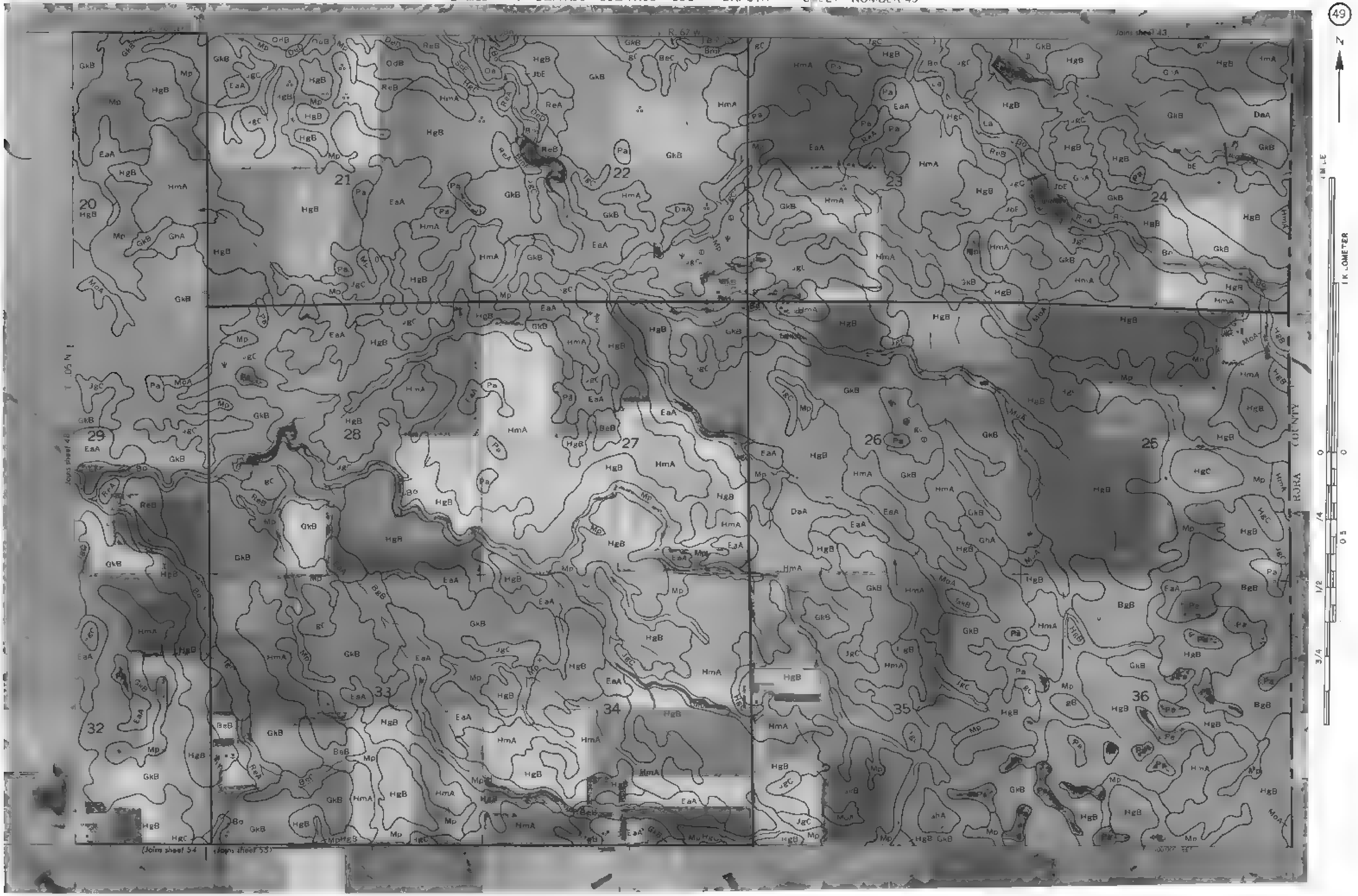
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 46



BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO. 47



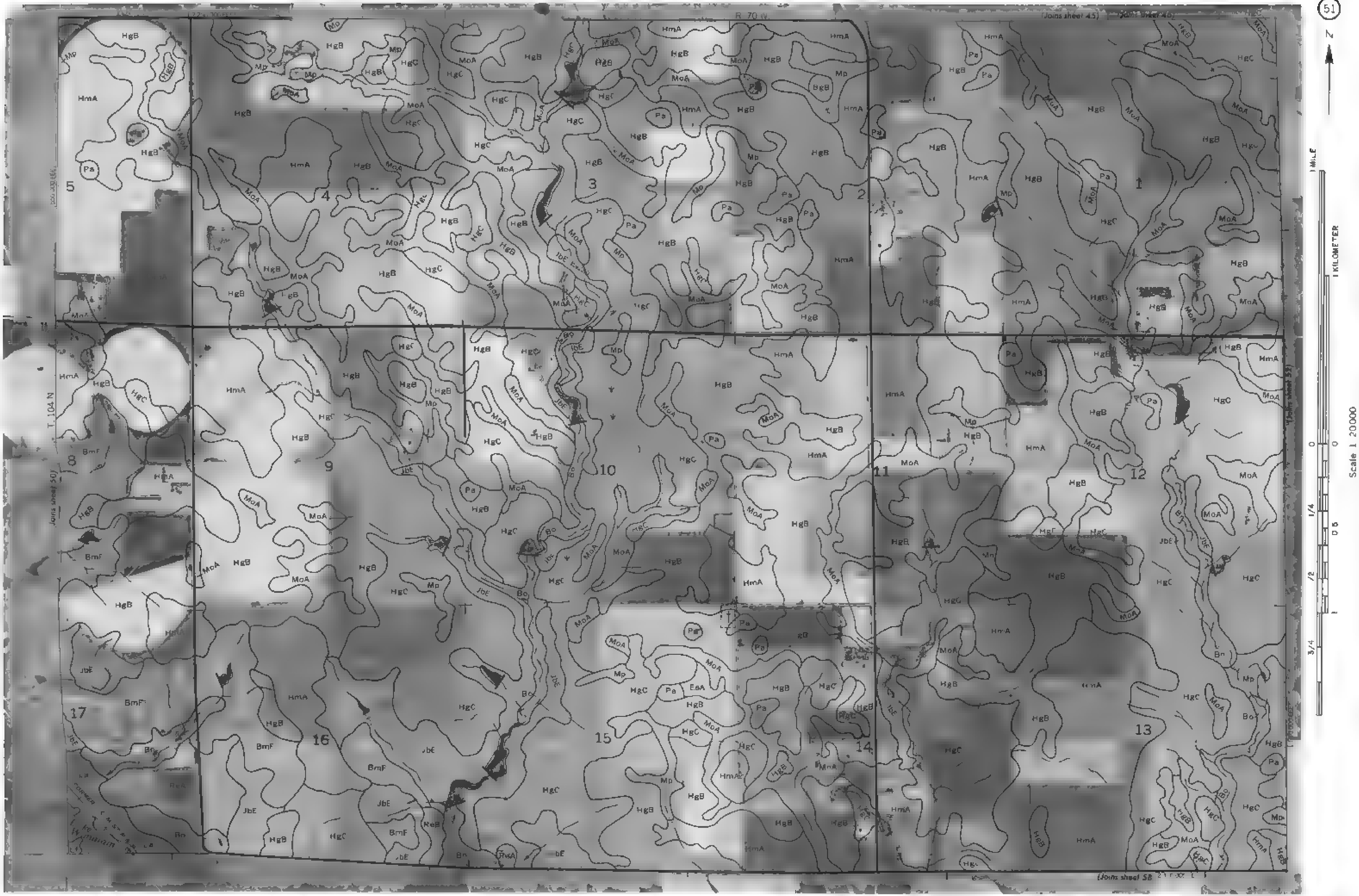

48
N
1 MILE
KILOMETER
Scale 1:20000
(Joins sheet 42)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 53)
(Joins sheet 54)
R. 68 W. | R. 67 W.
T. 105 N.
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32

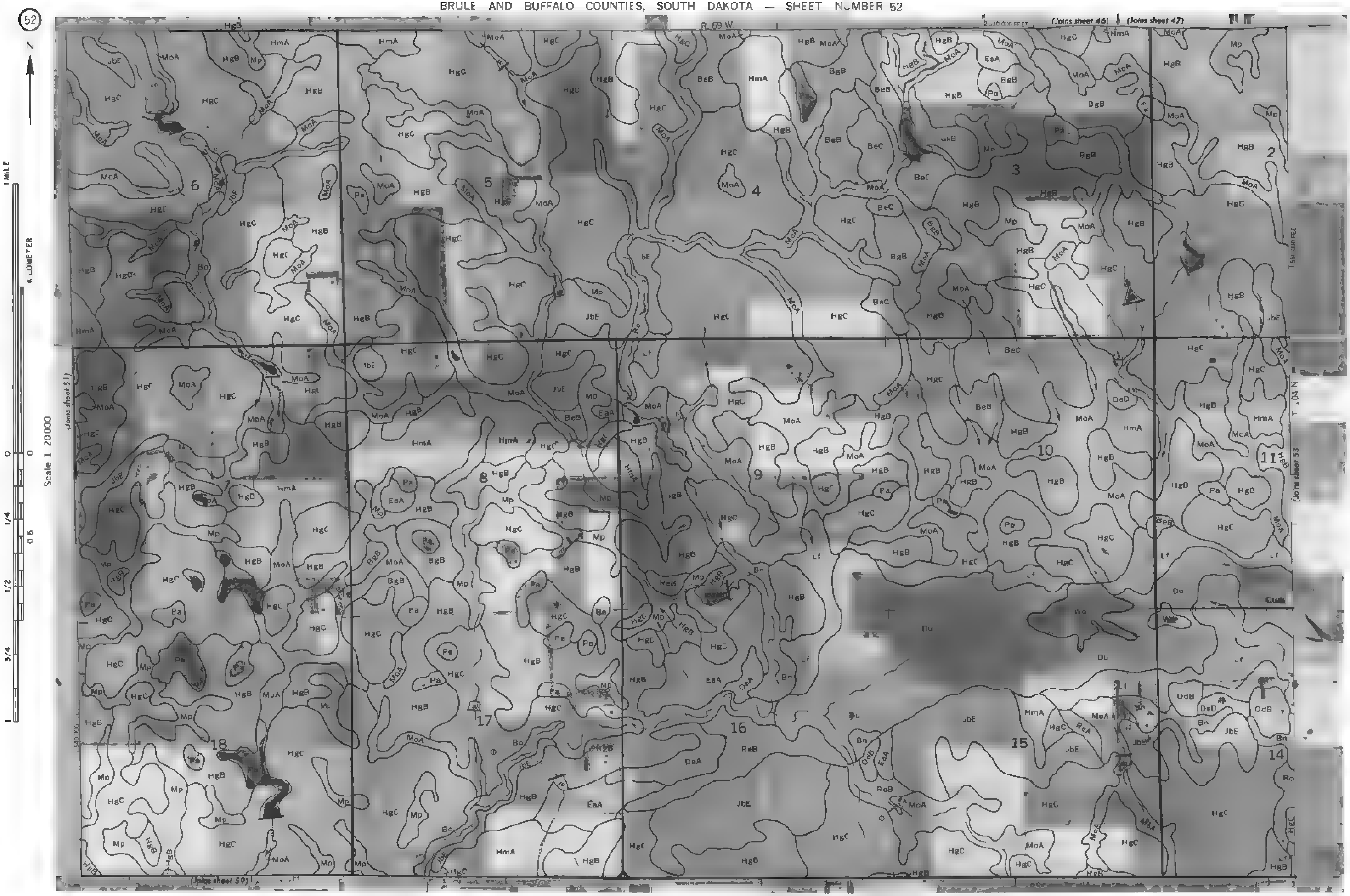


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 49


50
N
R 71 W
R 70 W
(Joins sheet 44)
(Joins sheet 45)
(Joins sheet 51)
(Joins sheet 57)
LAKE
FRANCIS
CASE
LYMAN COUNTY
Chamberlain
1
2
5
6
7
8
10
11
12
13
14
15
17
18
Lake Wanduta
104 N
MILE
1 KILOMETER
Scale 1:20000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 50

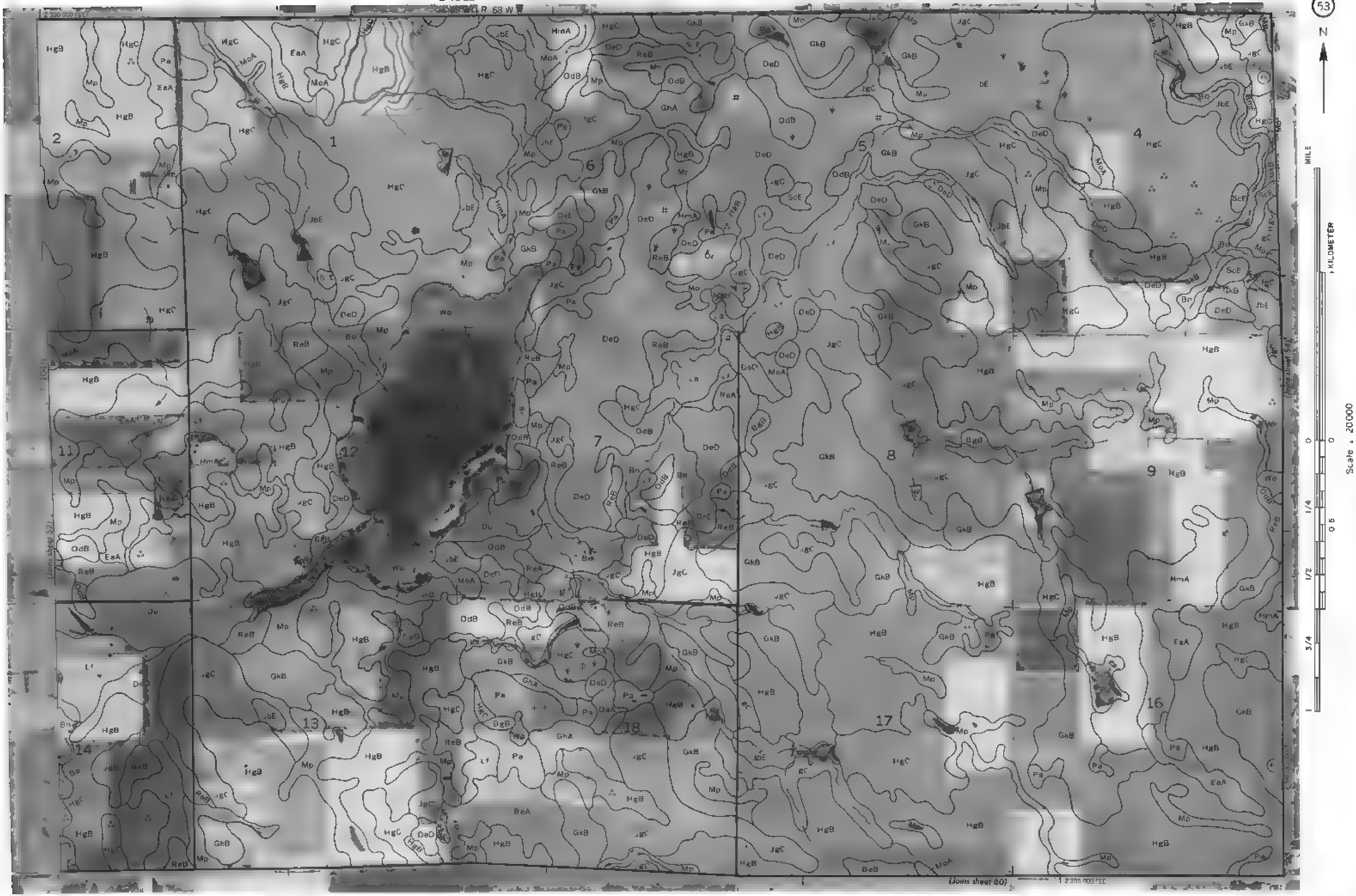
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO. 51





BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 52

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 53

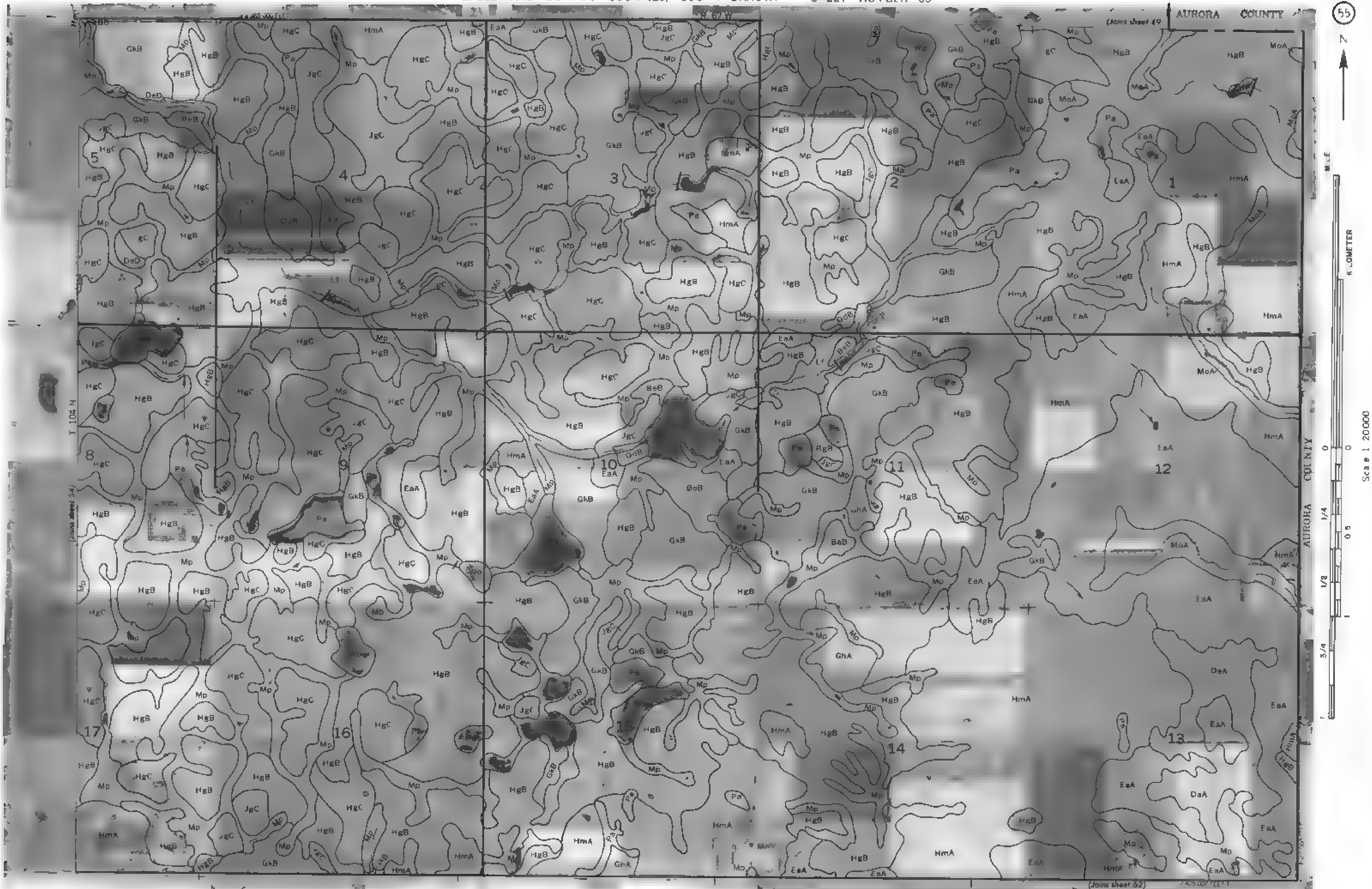


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 53

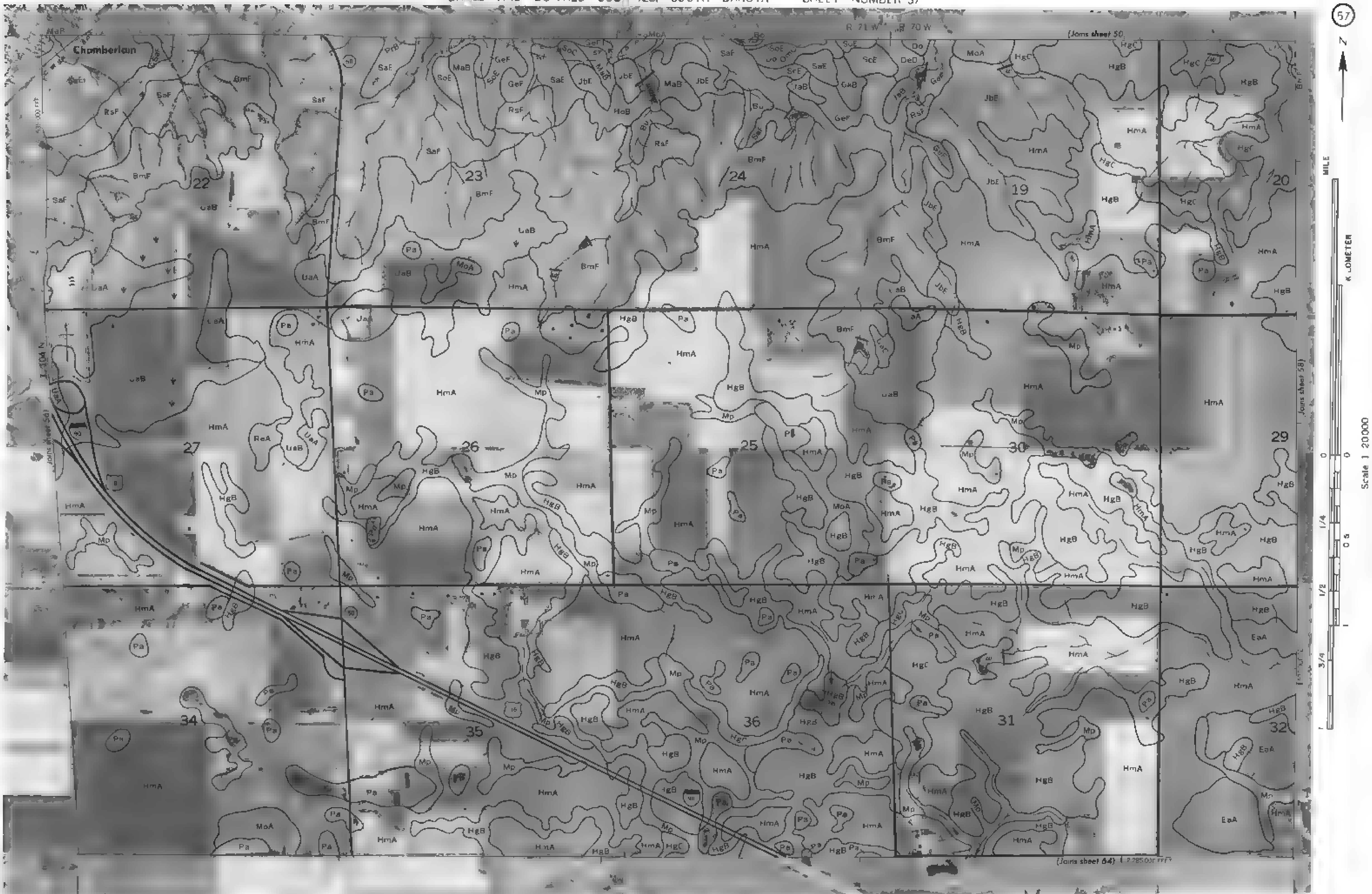
54

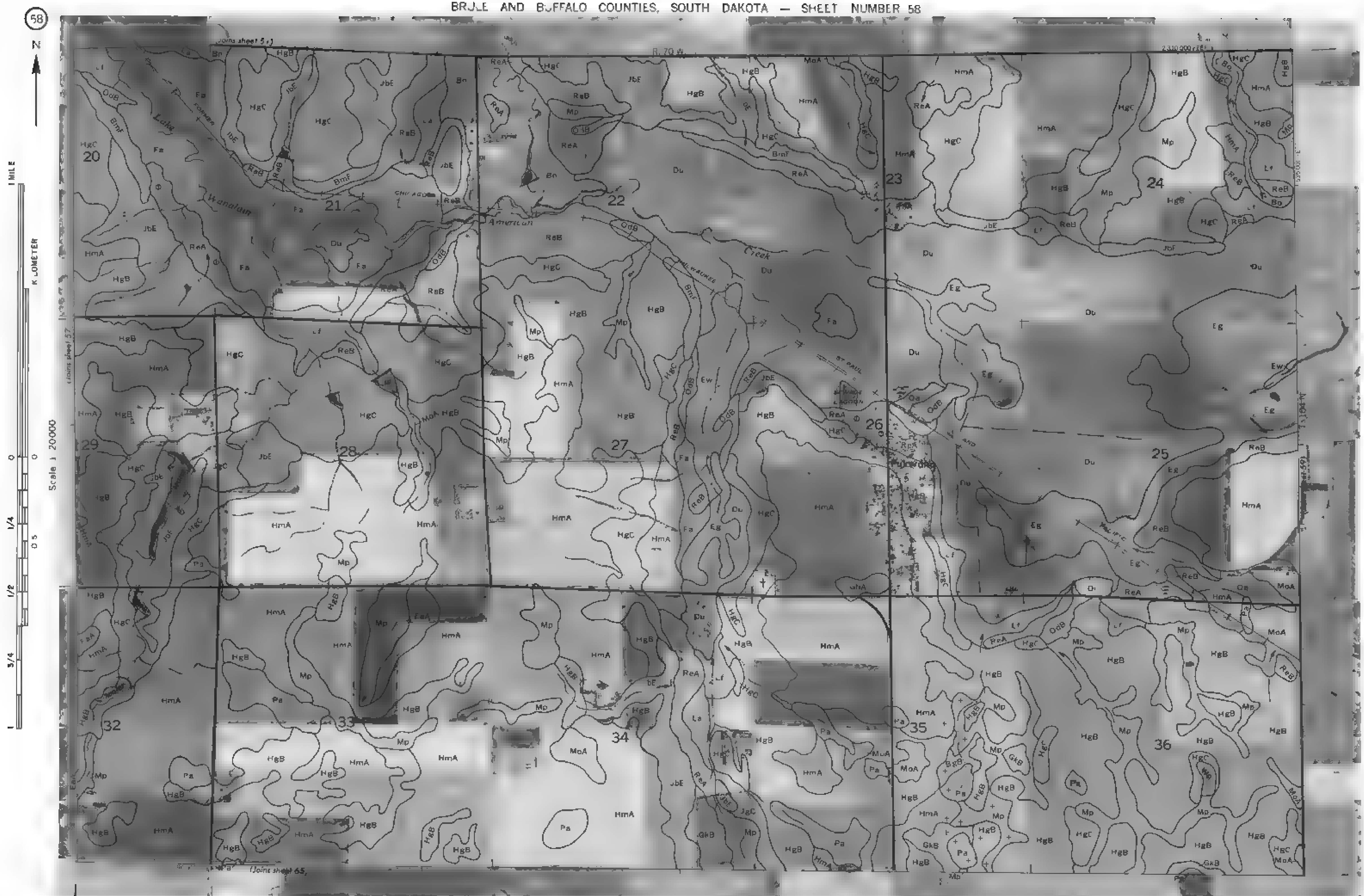

N
1 MILE
1 KILOMETER
Scale 1:20000
R 68 W
T 104 N
(Joins sheet 53)
(Joins sheet 55)
(Joins sheet 61)
1
2
3
5
6
7
8
10
11
12
13
14
15
17
18
HgB
HgC
Mp
Pa
JgC
GkB
HmA
DeD
OdB
Wo
BeC
ScE
JbE
MoA
EaA
Bn
Oa
Or

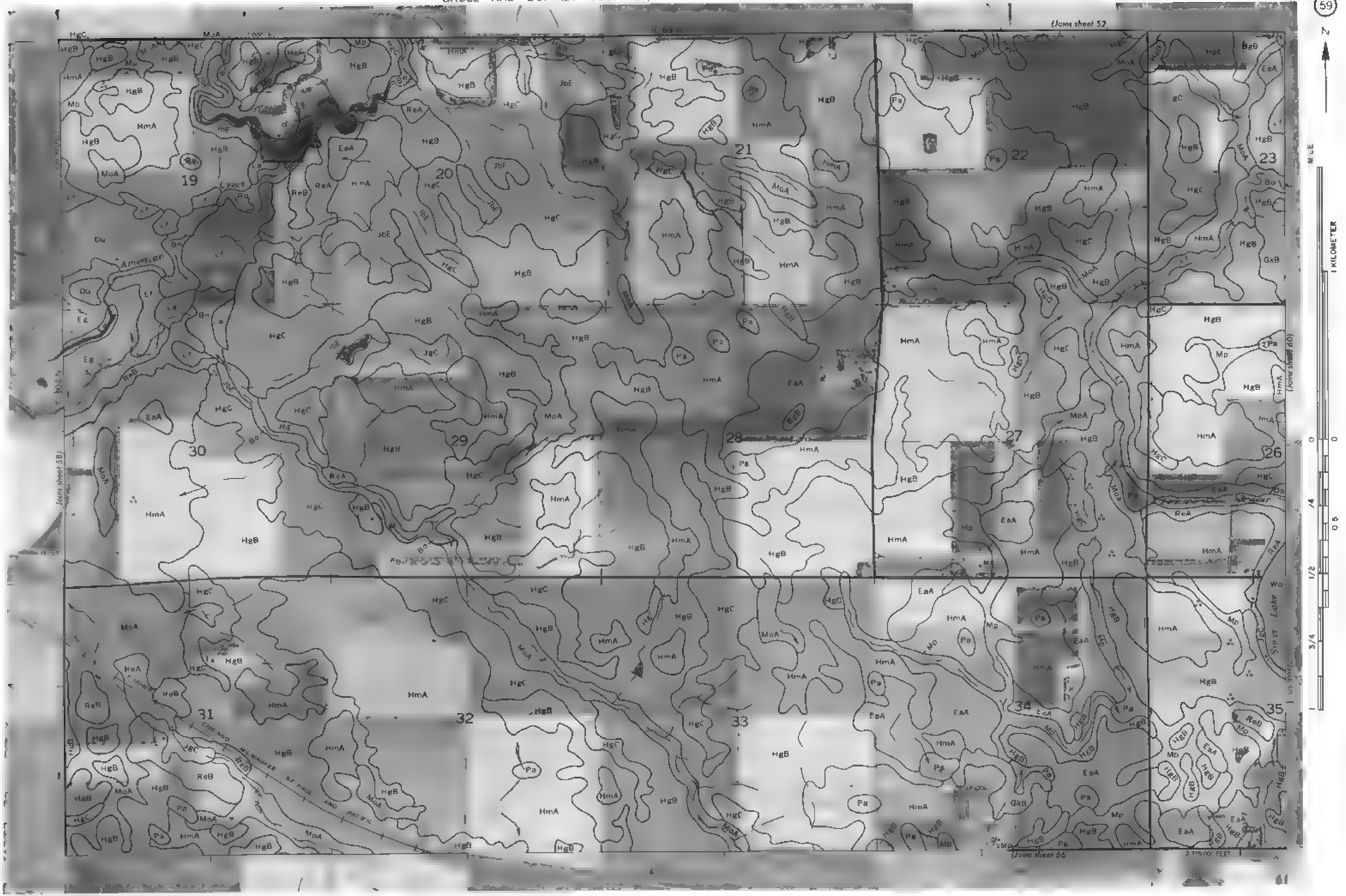
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 55



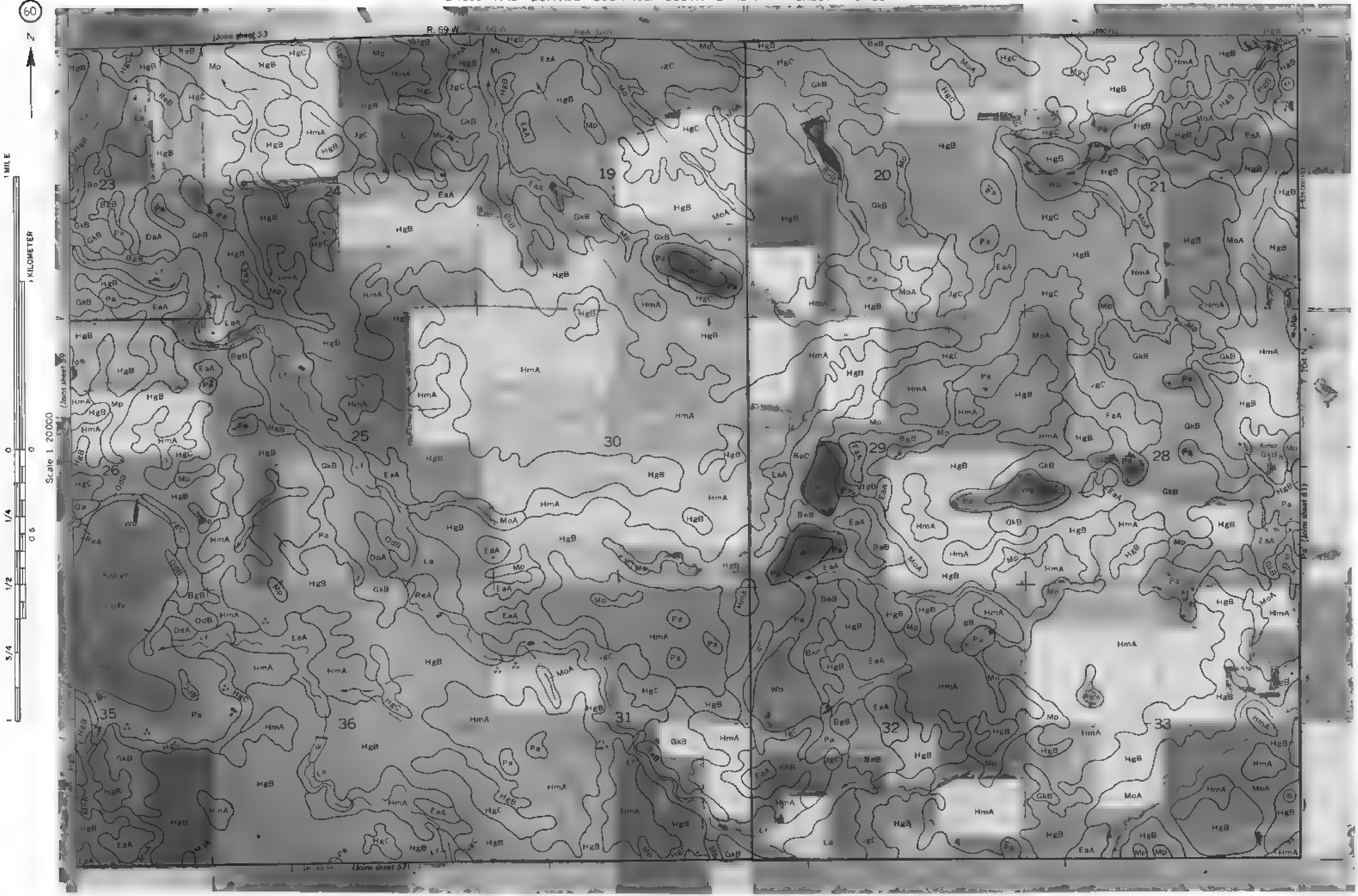

56
N
1 MILE
KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
1
R. 72 W. | R. 71 W.
(Joins inset)
Chamberlain
LAKE
FRANCIS
CASE
LYMAN
COUNTY
INDEFINITE BOUNDARY
FORMER
CHICAGO
(Joins sheet 57)
(Joins sheet 63)
T. 104 N.
20
21
25
28
29
30
31
32
33
36
SaF
SaE
SoE
SoC
RsF
LoA
LoB
GeF
GeE
BmF
UaB
UaA
UaC
MoA
HmA
Pa
PrB
SsE


57
Chamberlain
R 71 W
R 70 W
(Joins sheet 50)
(Joins sheet 58)
(Joins sheet 64)
(Joins sheet 56)
T. 104 N.
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
N
MILE
KILOMETER
Scale 1:20 000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 57


58
N
1 MILE
KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 51)
R. 70 W.
(Joins sheet 57)
(Joins sheet 65)
Lake Wanalain
American Creek
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
HgB
HgC
HmA
JbE
ReB
ReA
Du
Fa
Mp
Pa
MoA
Eg
OdB
BmF
Lf
Bo
GkB


59
(Joins sheet 52)
R. 69 W.
19
20
21
22
23
30
29
28
27
26
31
32
33
34
35
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 66)
American
Creek
Lake
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
T. 104 N.
N
MILE
1 KILOMETER
Scale 1:20 000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 59

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA SHEET NUMBER 60

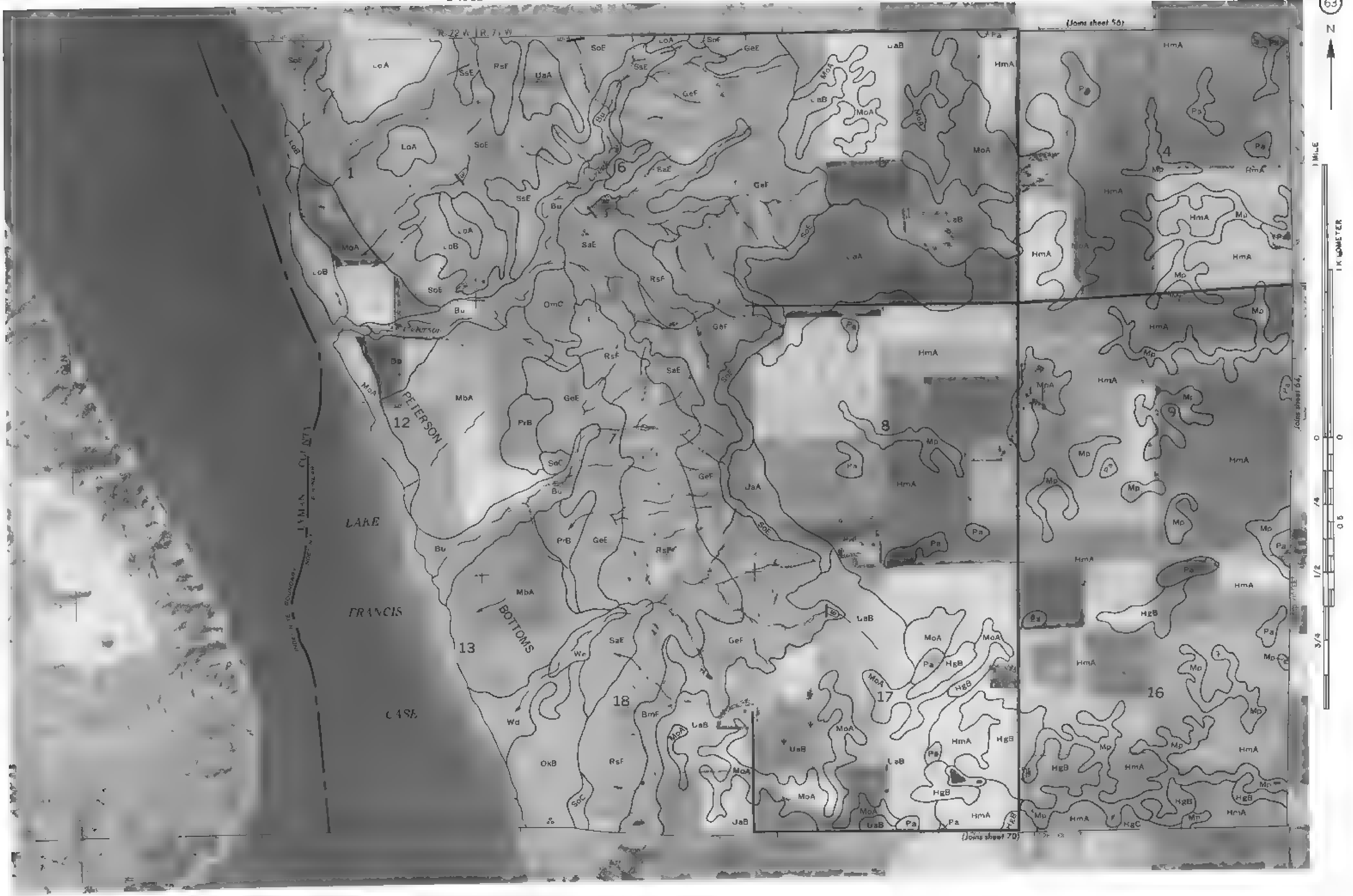


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 60

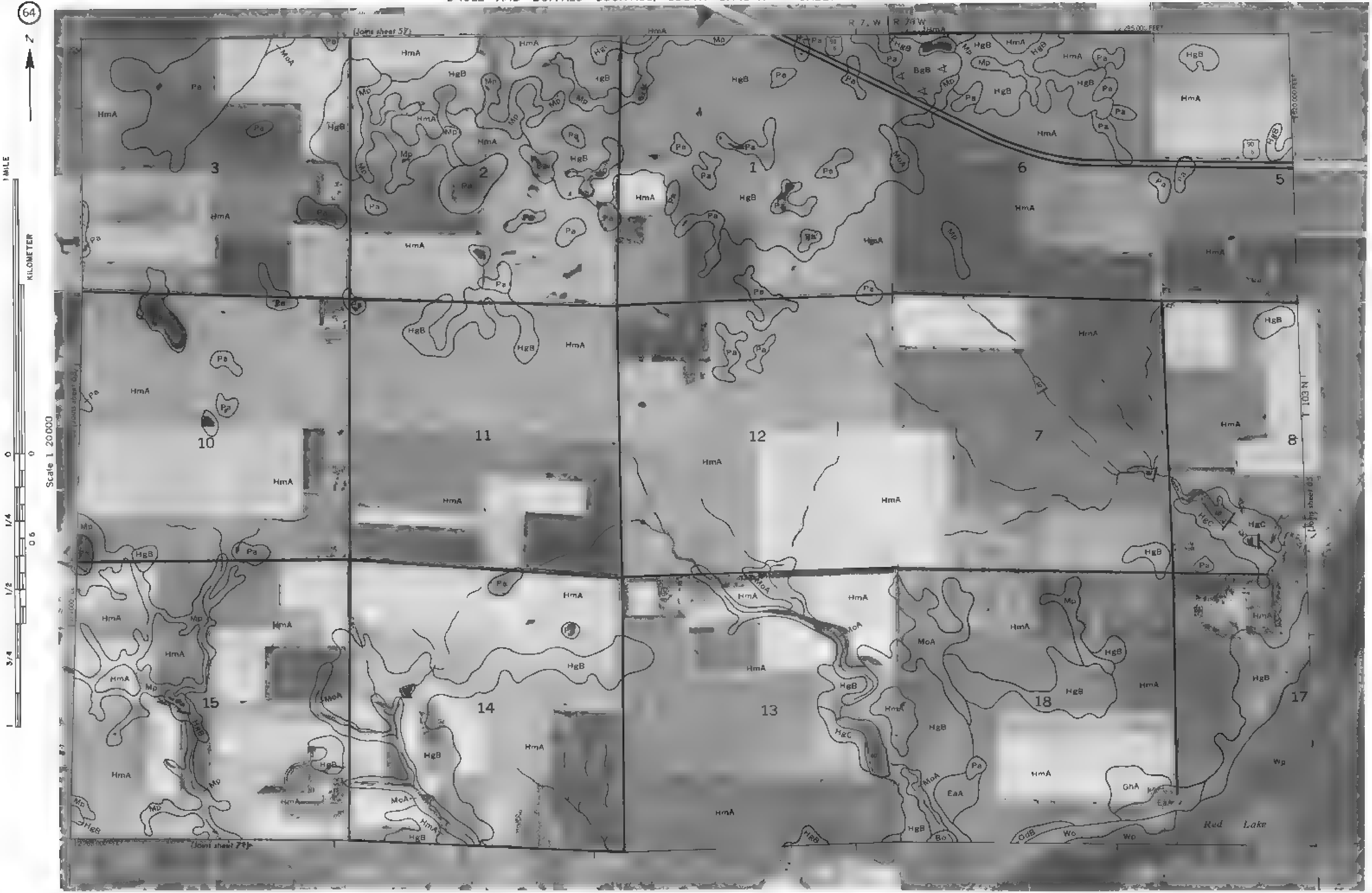
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 61

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 62

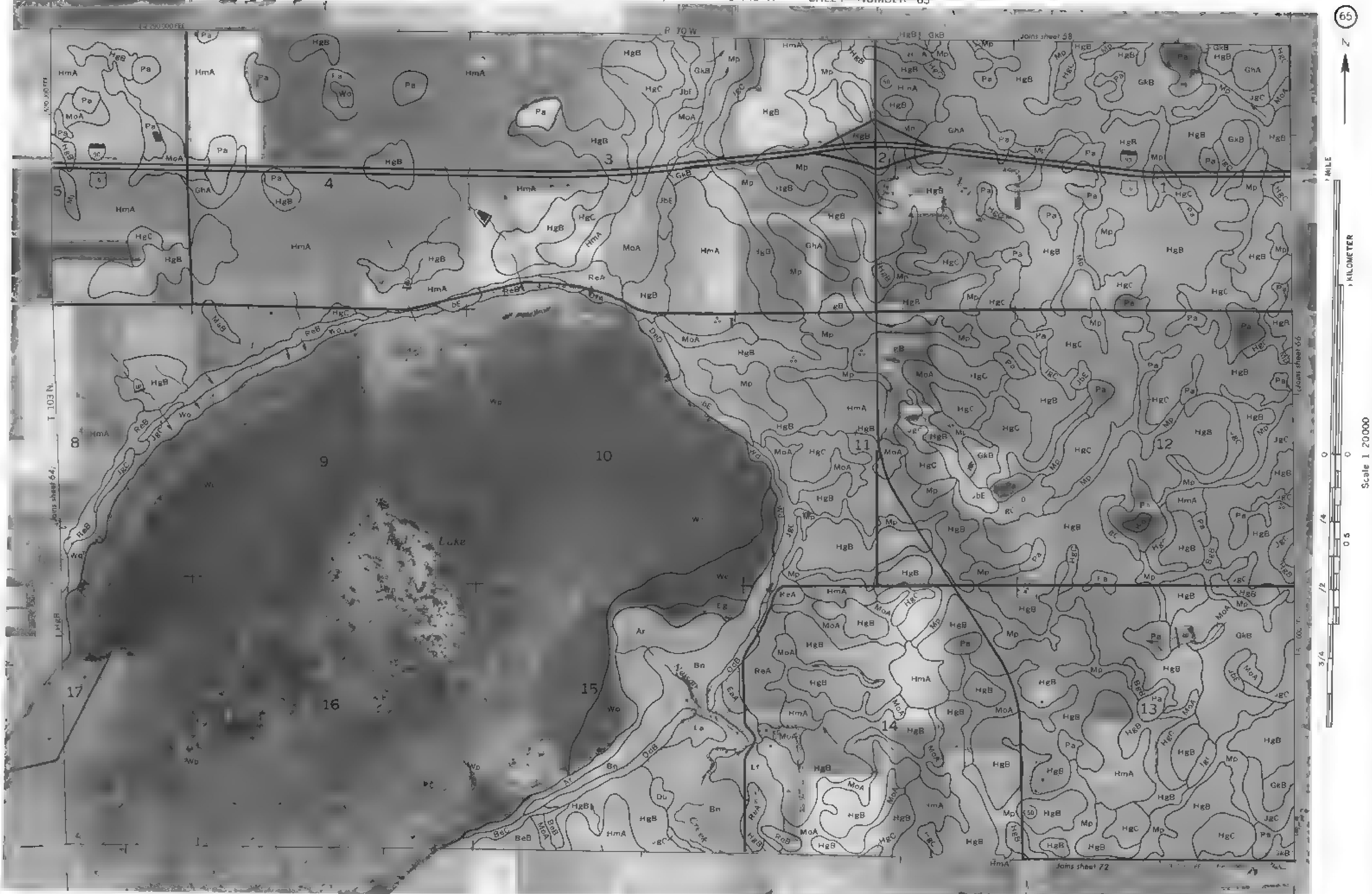
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 62



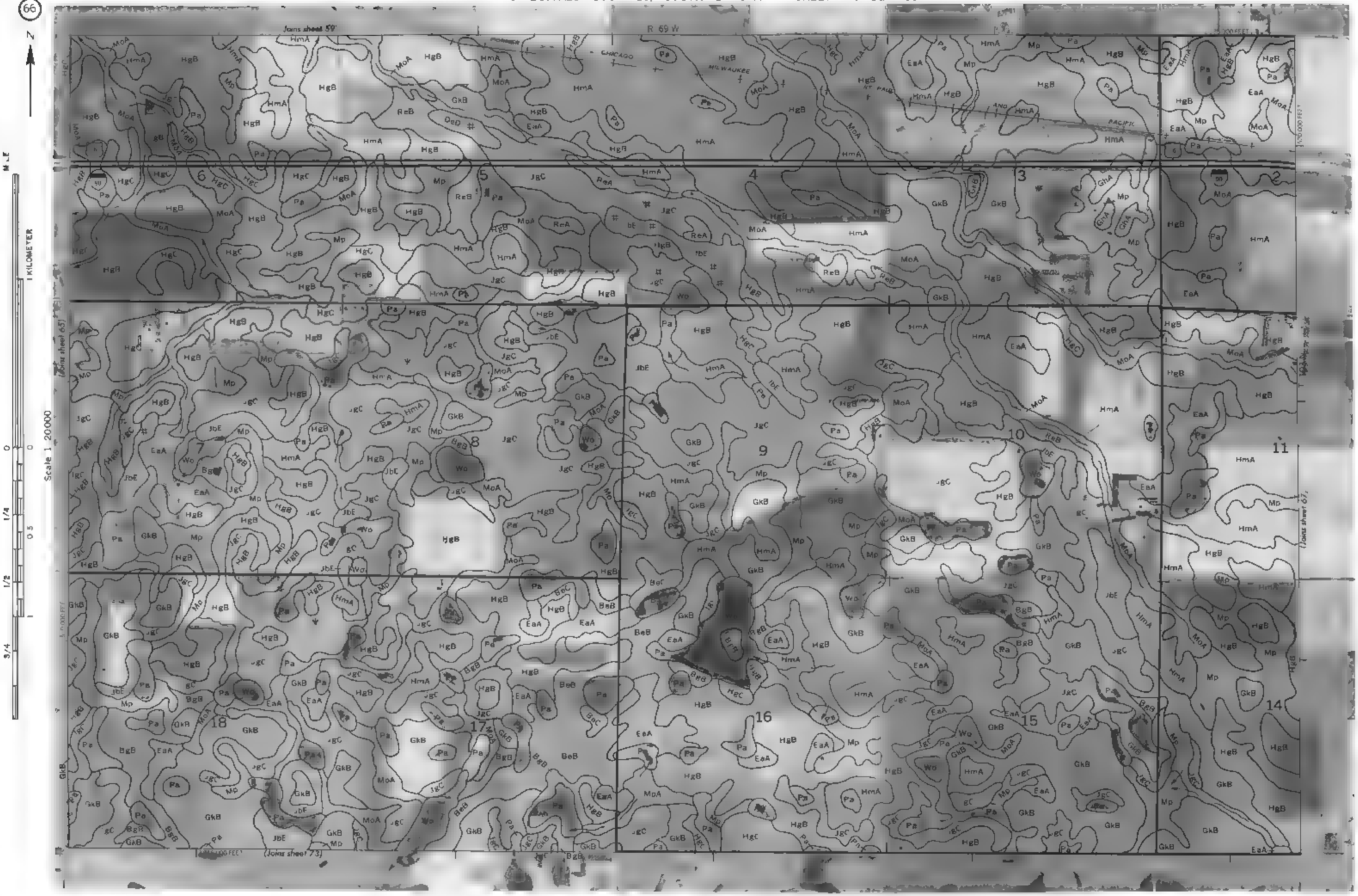
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 63



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 64



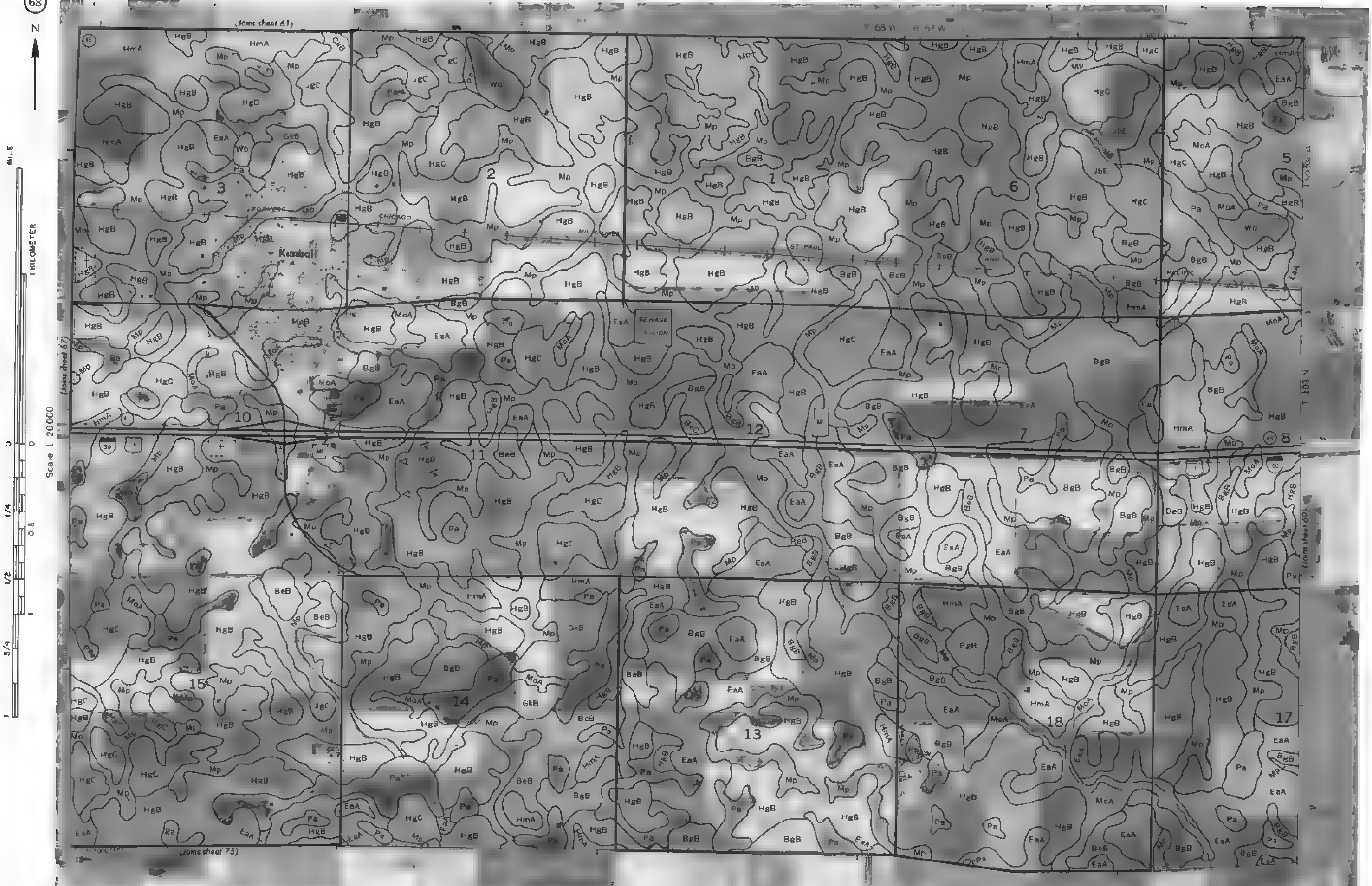
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 65



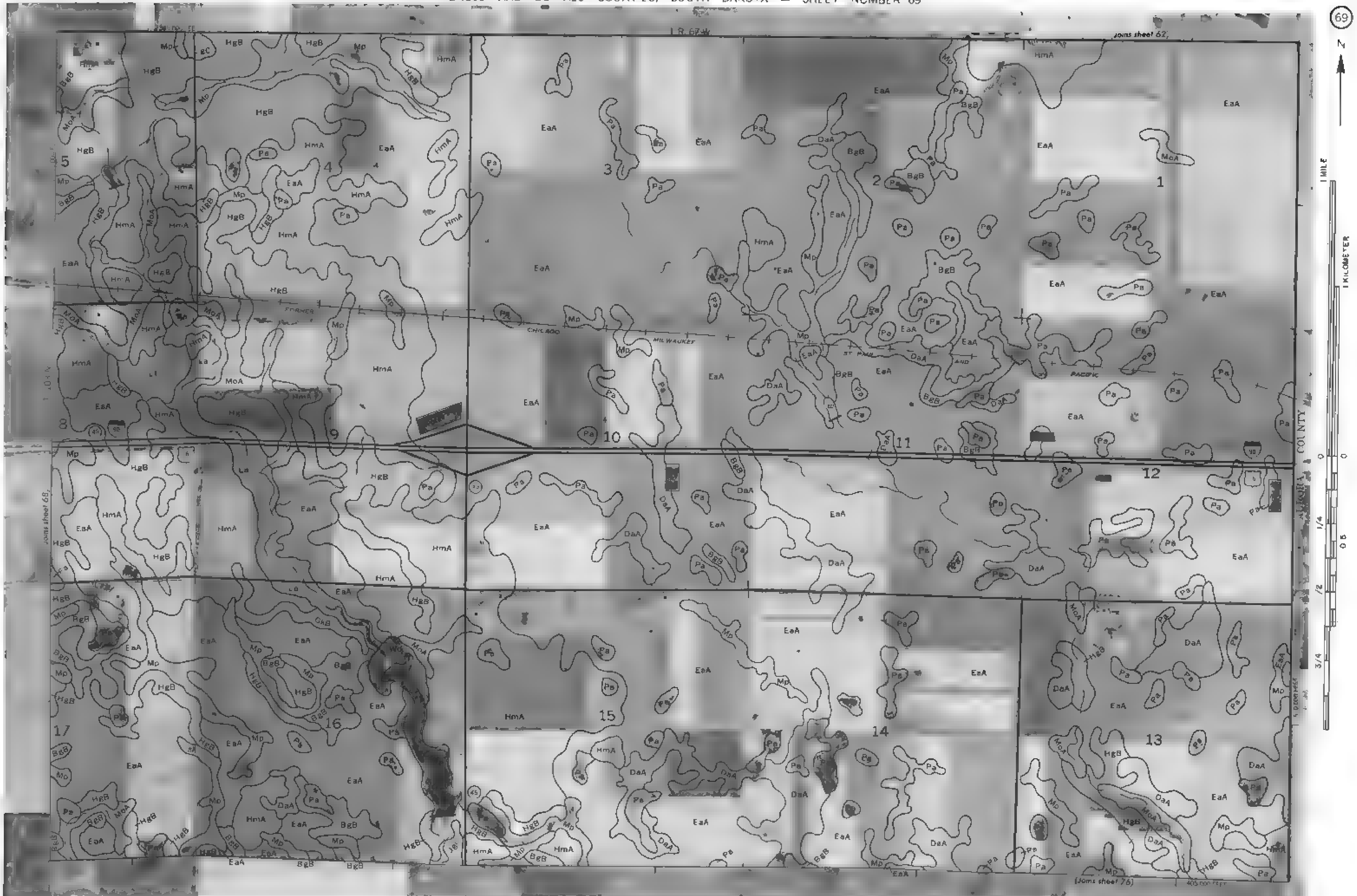
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 66

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 67

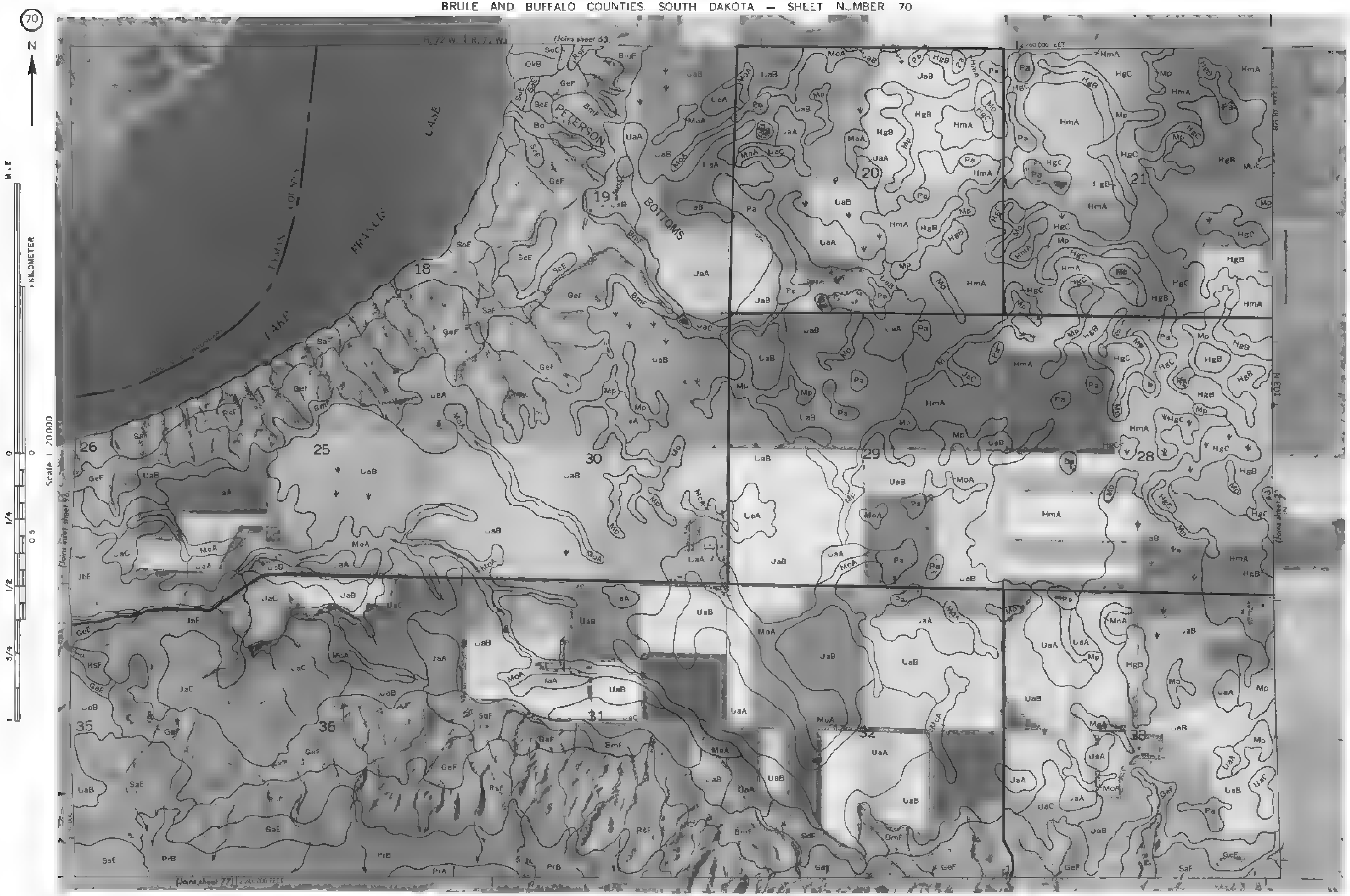
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 68



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 68

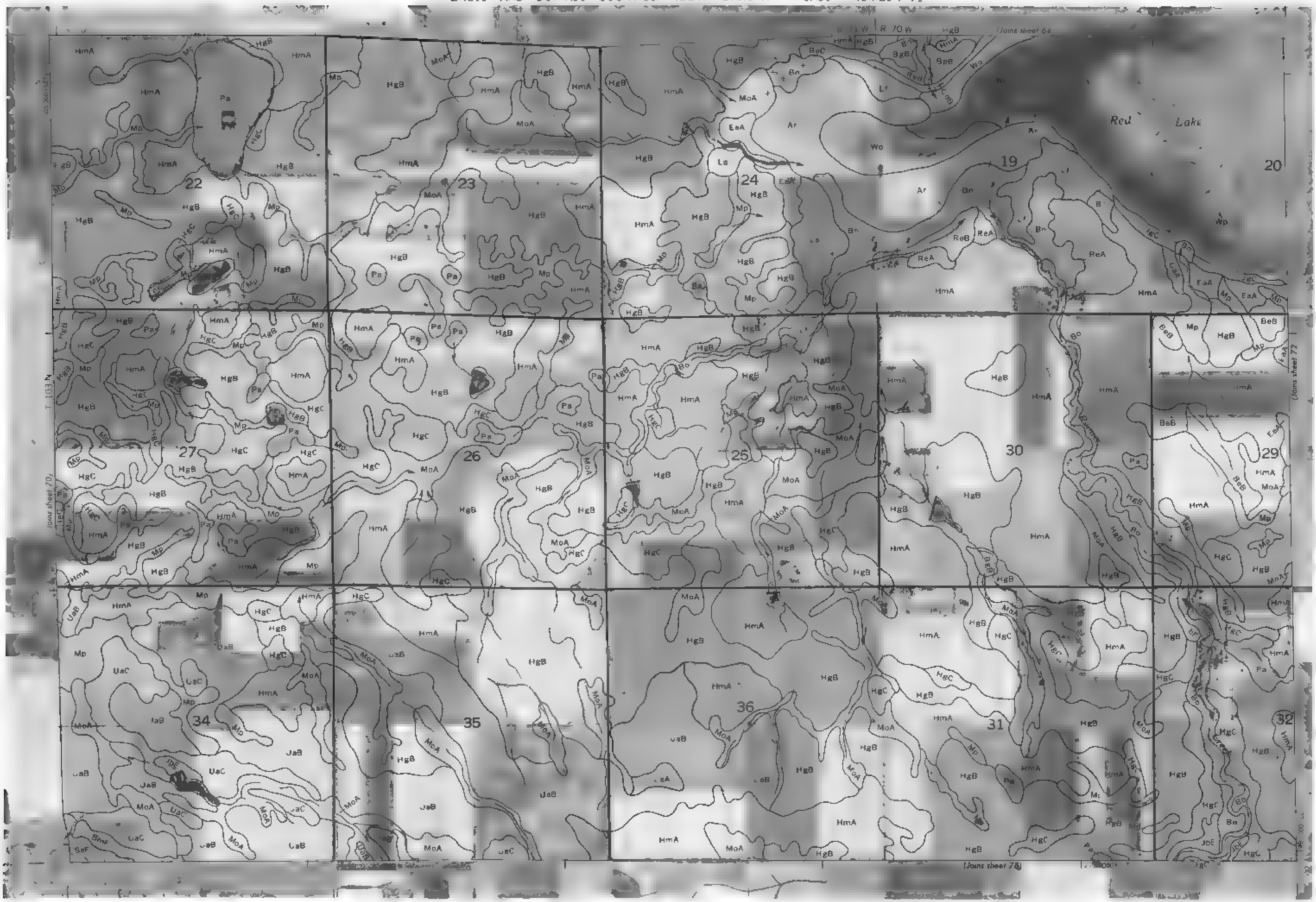


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 69



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 70

71



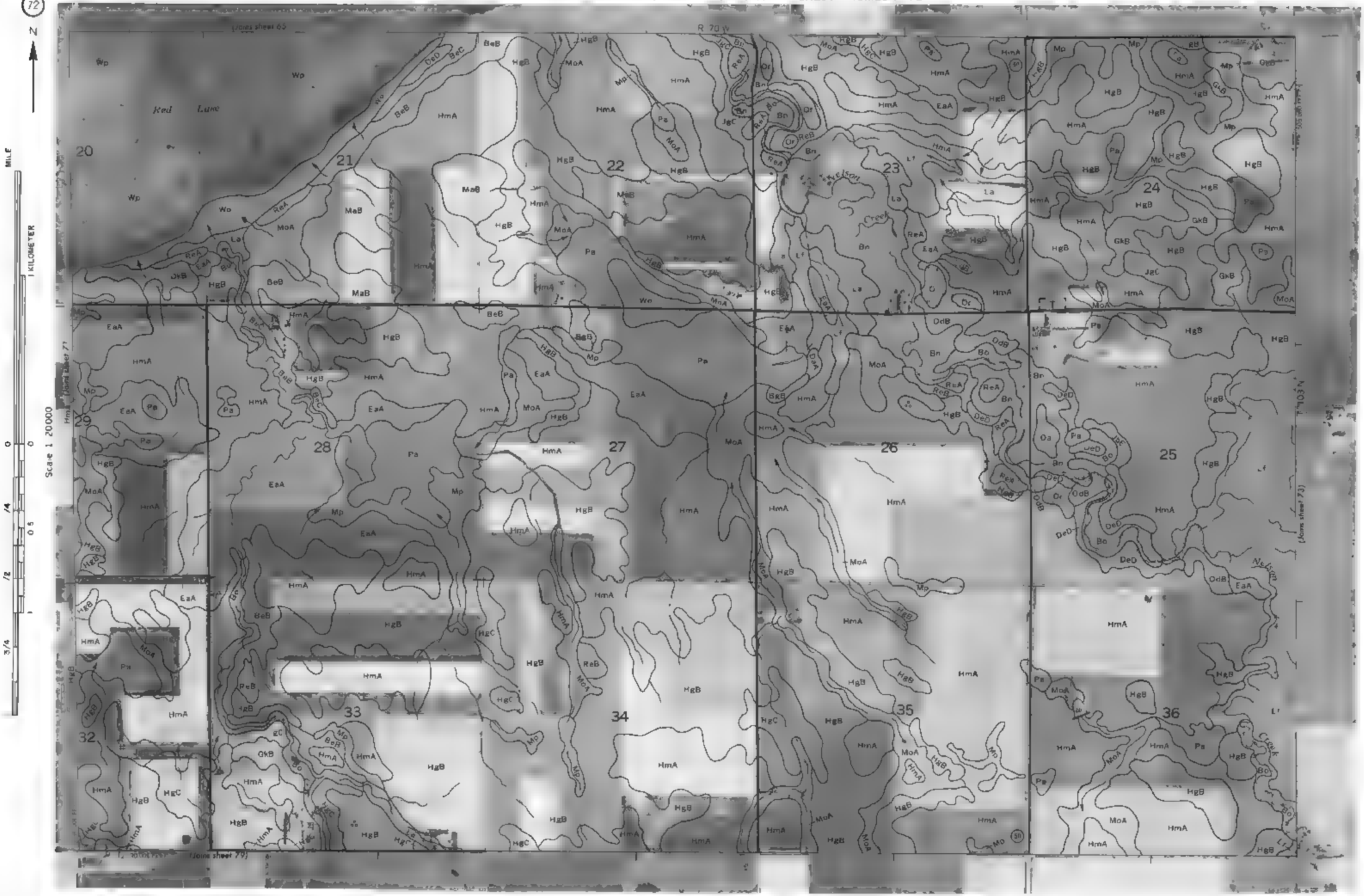
N

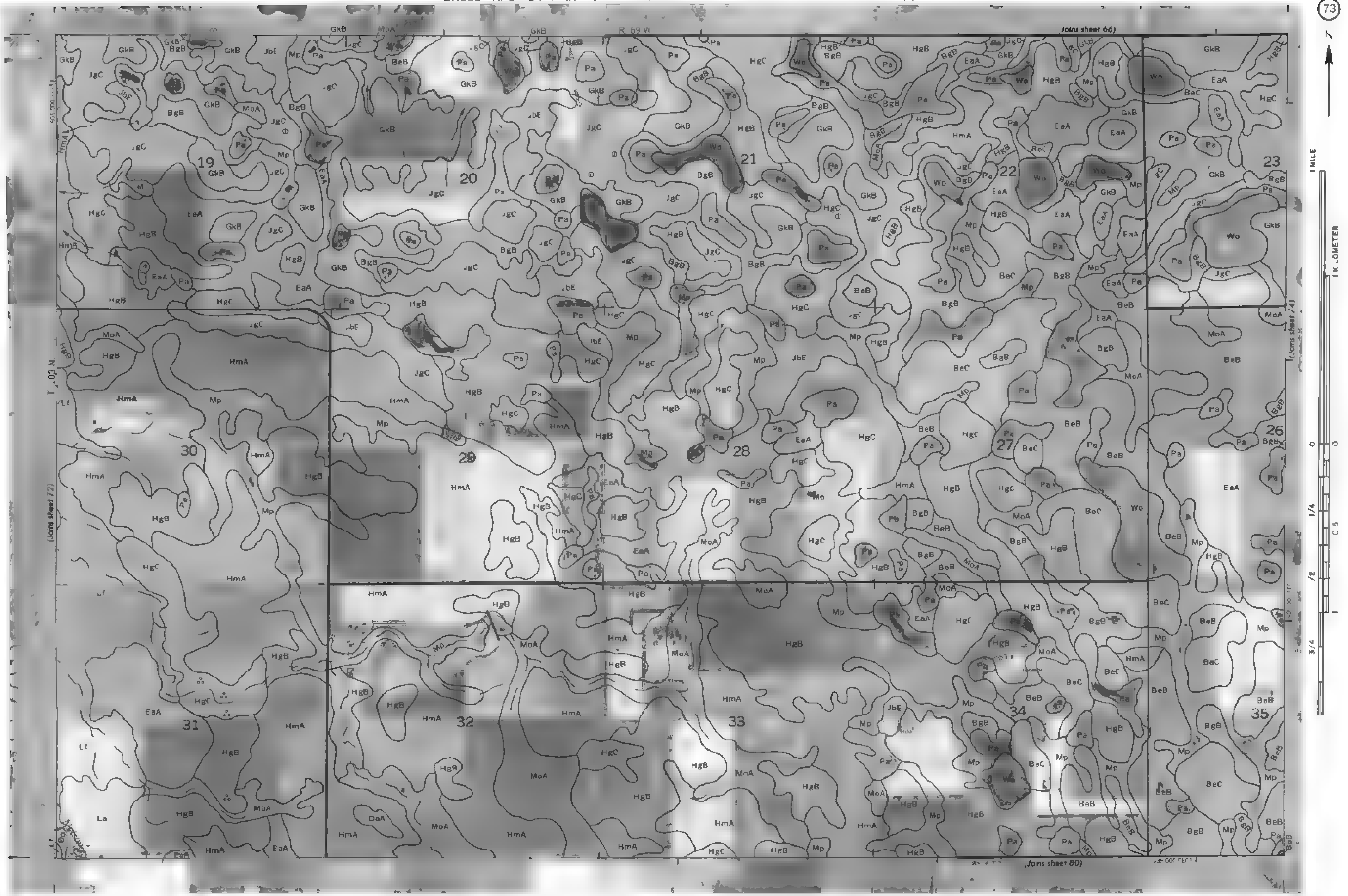
1 MILE

1 KILOMETER

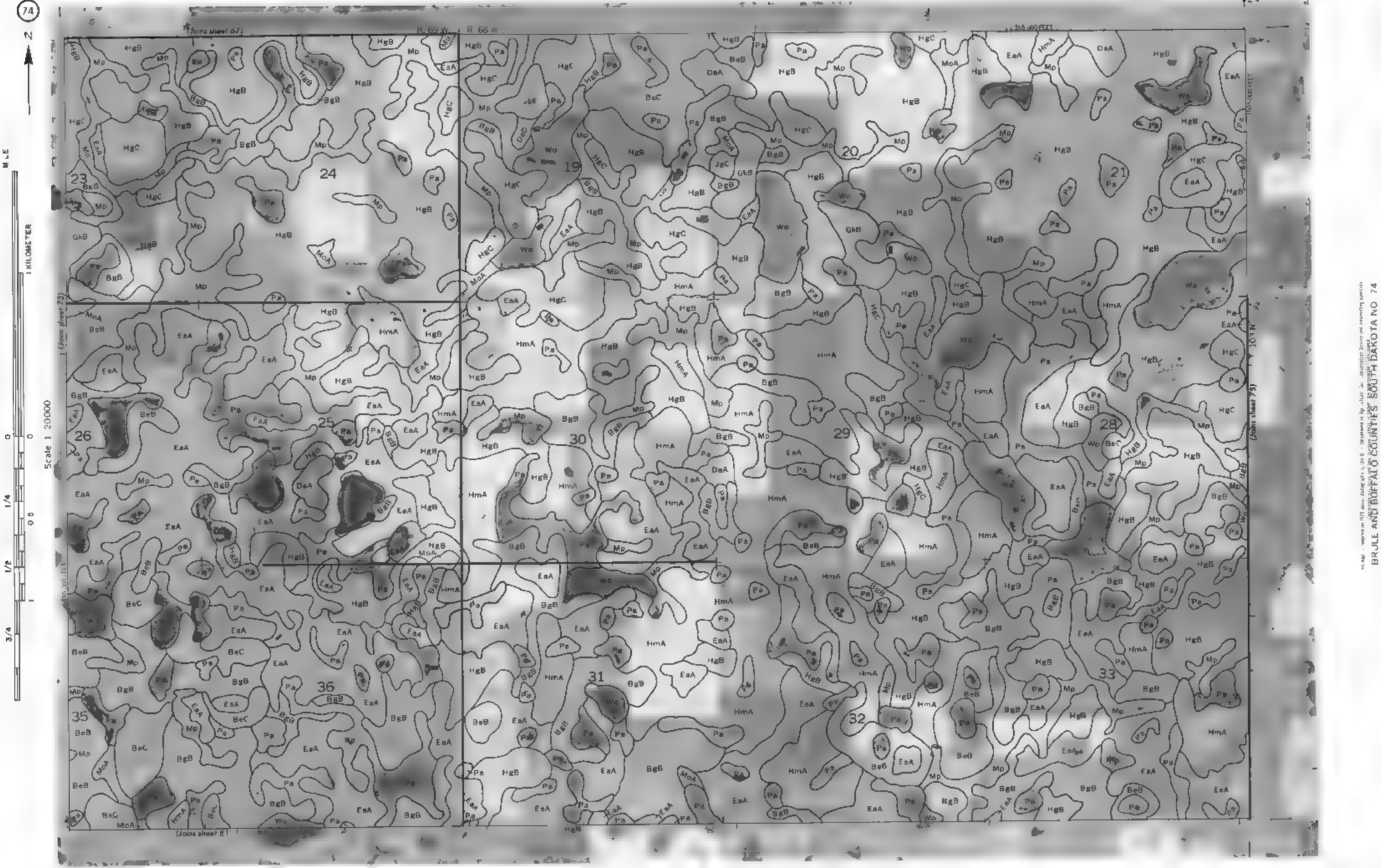
Scale 1:20000

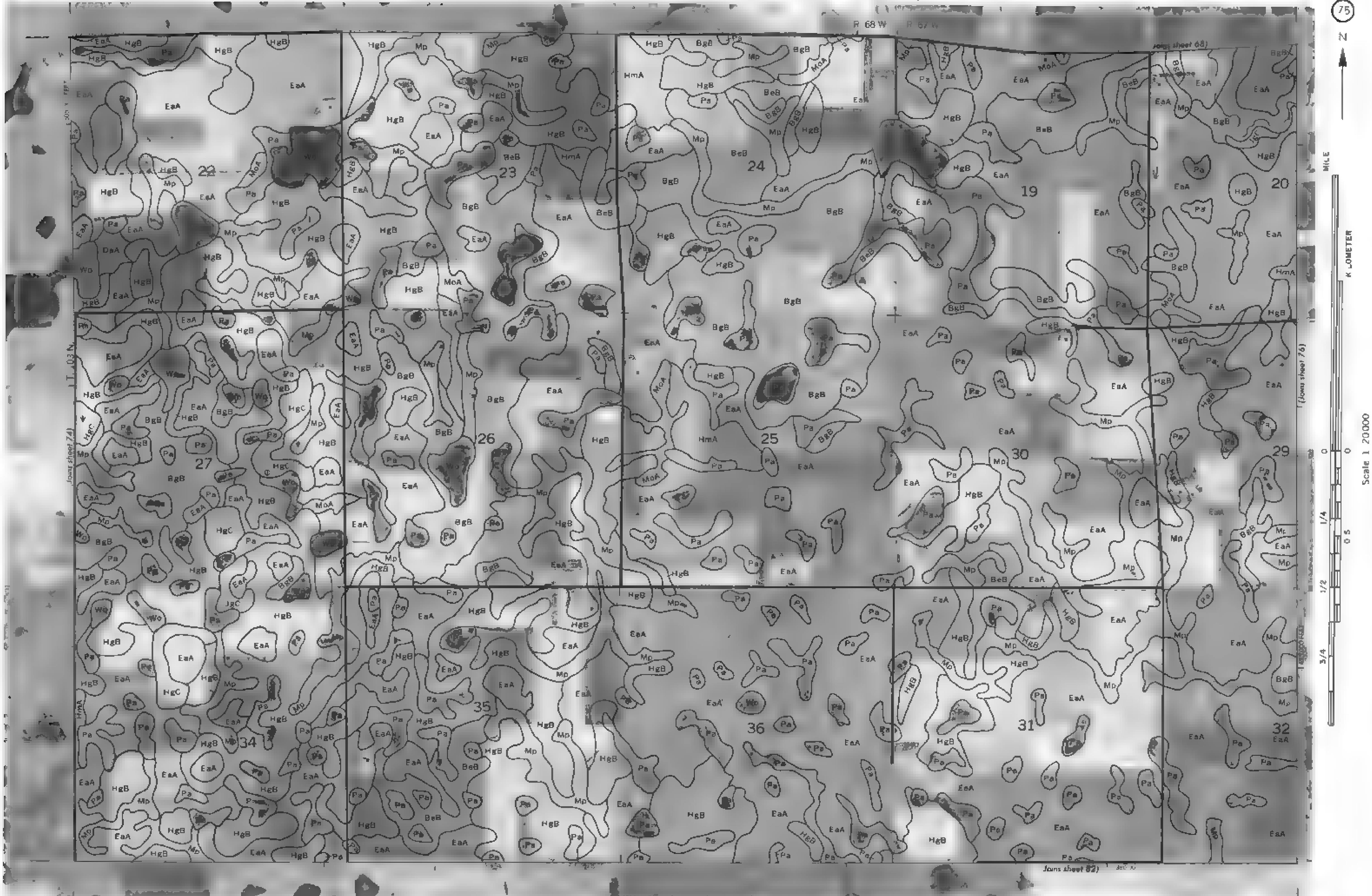
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 71


72
N
(Joins sheet 65)
R. 70 W.
Red Lake
Nelson Creek
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
T. 103 N.
(Joins sheet 71)
(Joins sheet 73)
(Joins sheet 79)
MILE
1 KILOMETER
Scale 1:20000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 72



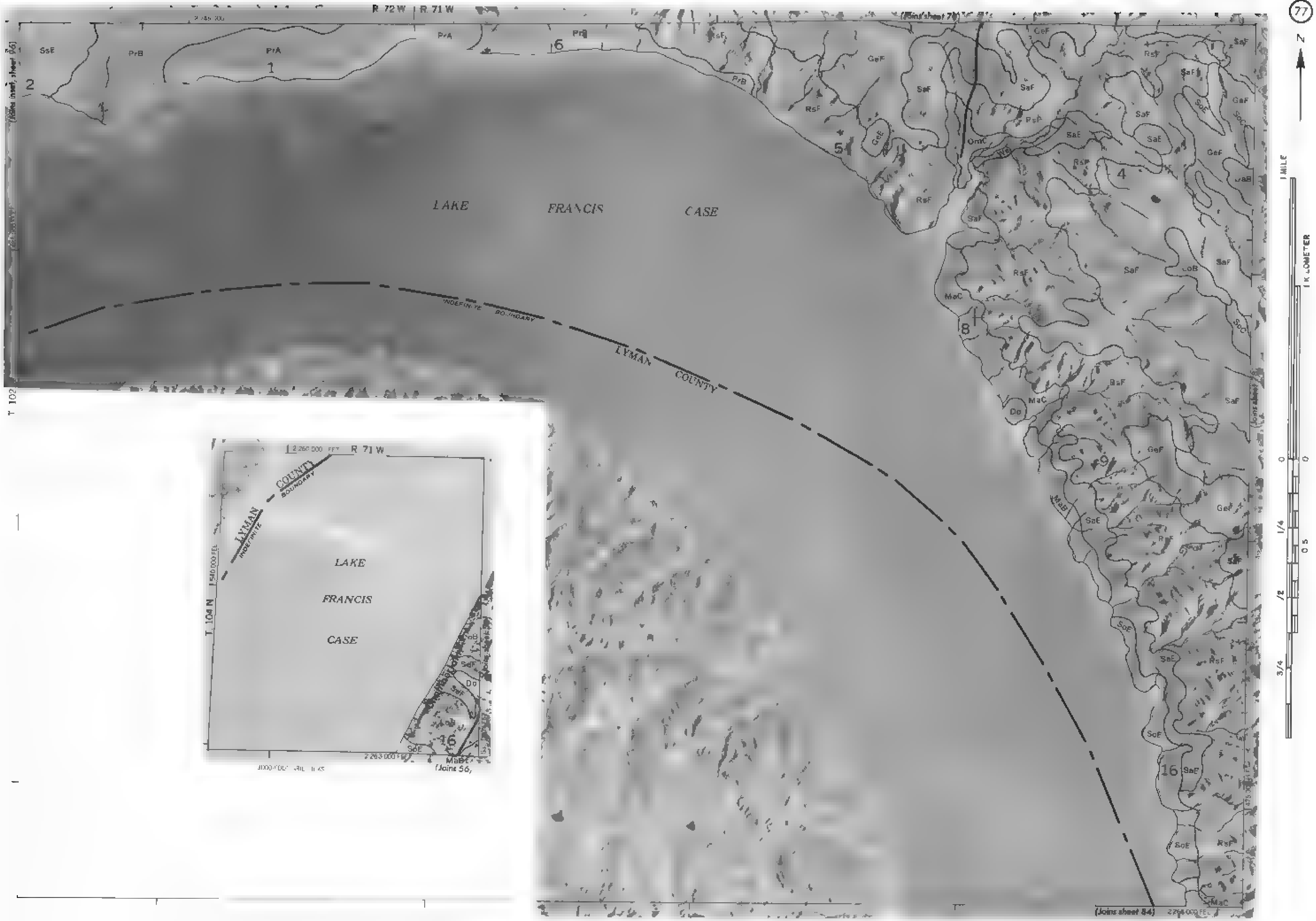
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 73


74
N
(Joins sheet 67)
R. 69 W.
R. 68 W.
(Joins sheet 72)
(Joins sheet 75)
(Joins sheet 81)
T. 103 N.
Scale 1:20000
MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 74

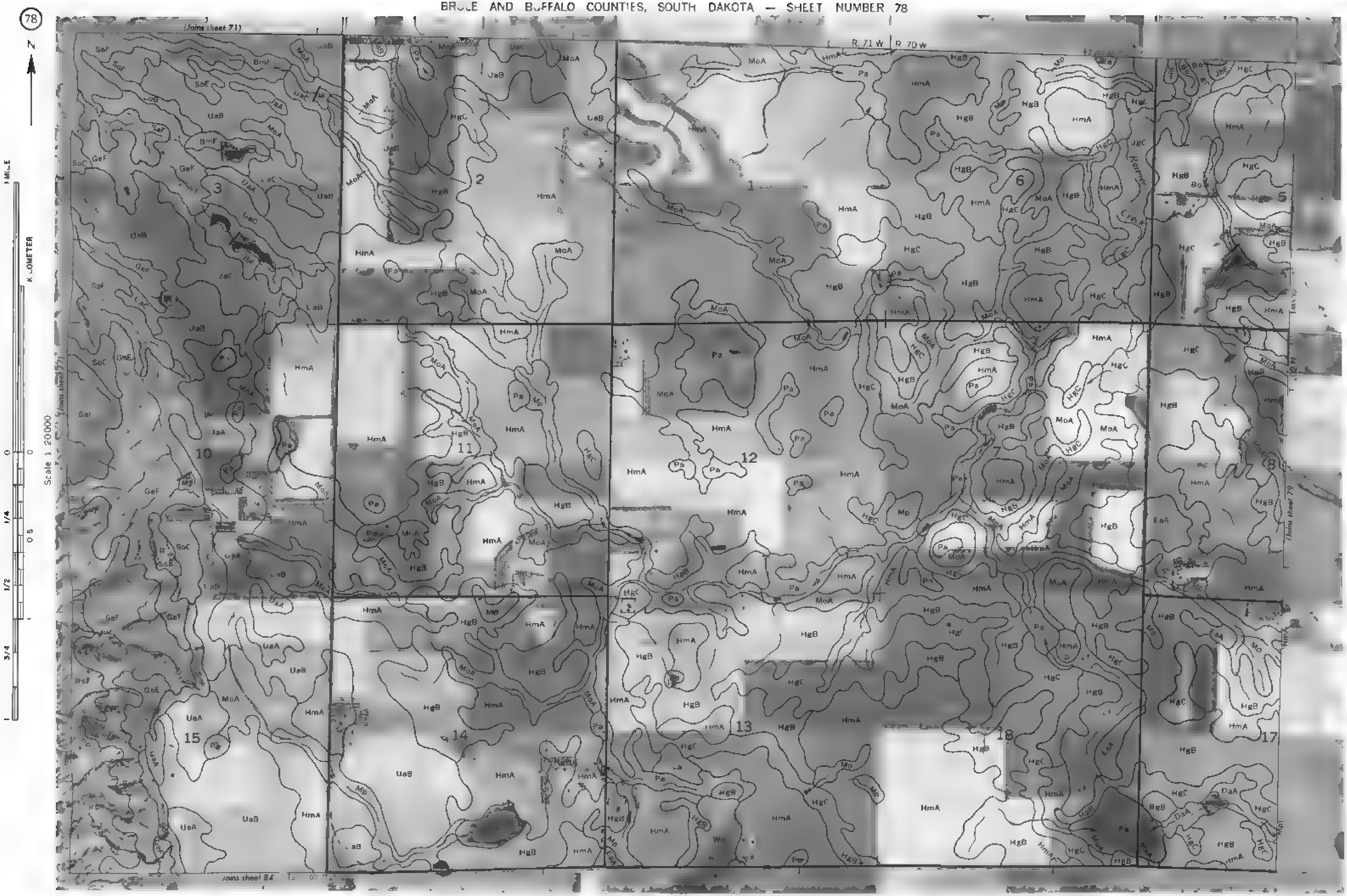


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 75

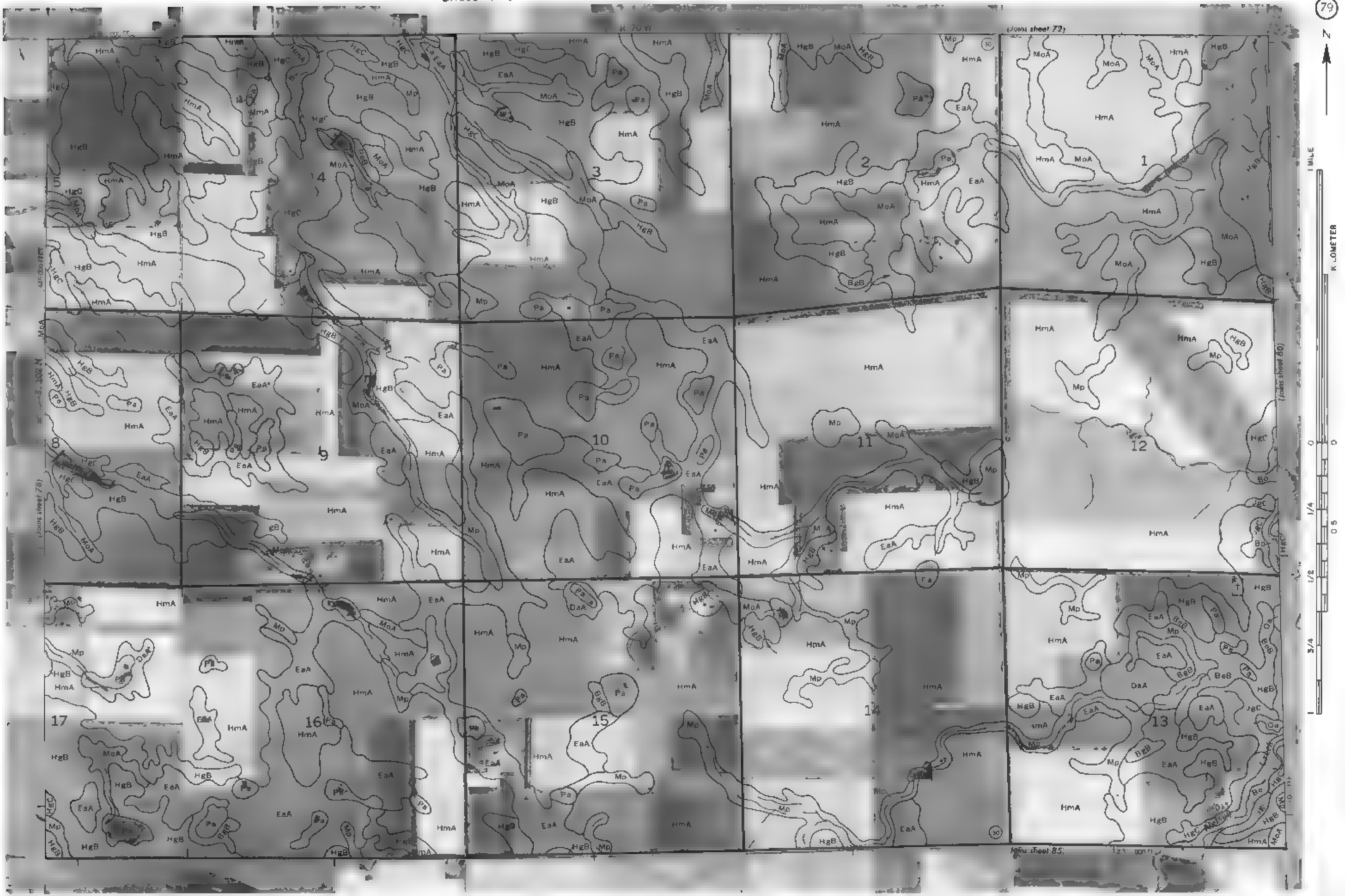

76
N
MILE
KILOMETER
Scale 1:20000
(Joins sheet 65)
(Joins sheet 83)
R. 67 W.
T. 103 N.
AURORA COUNTY
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36



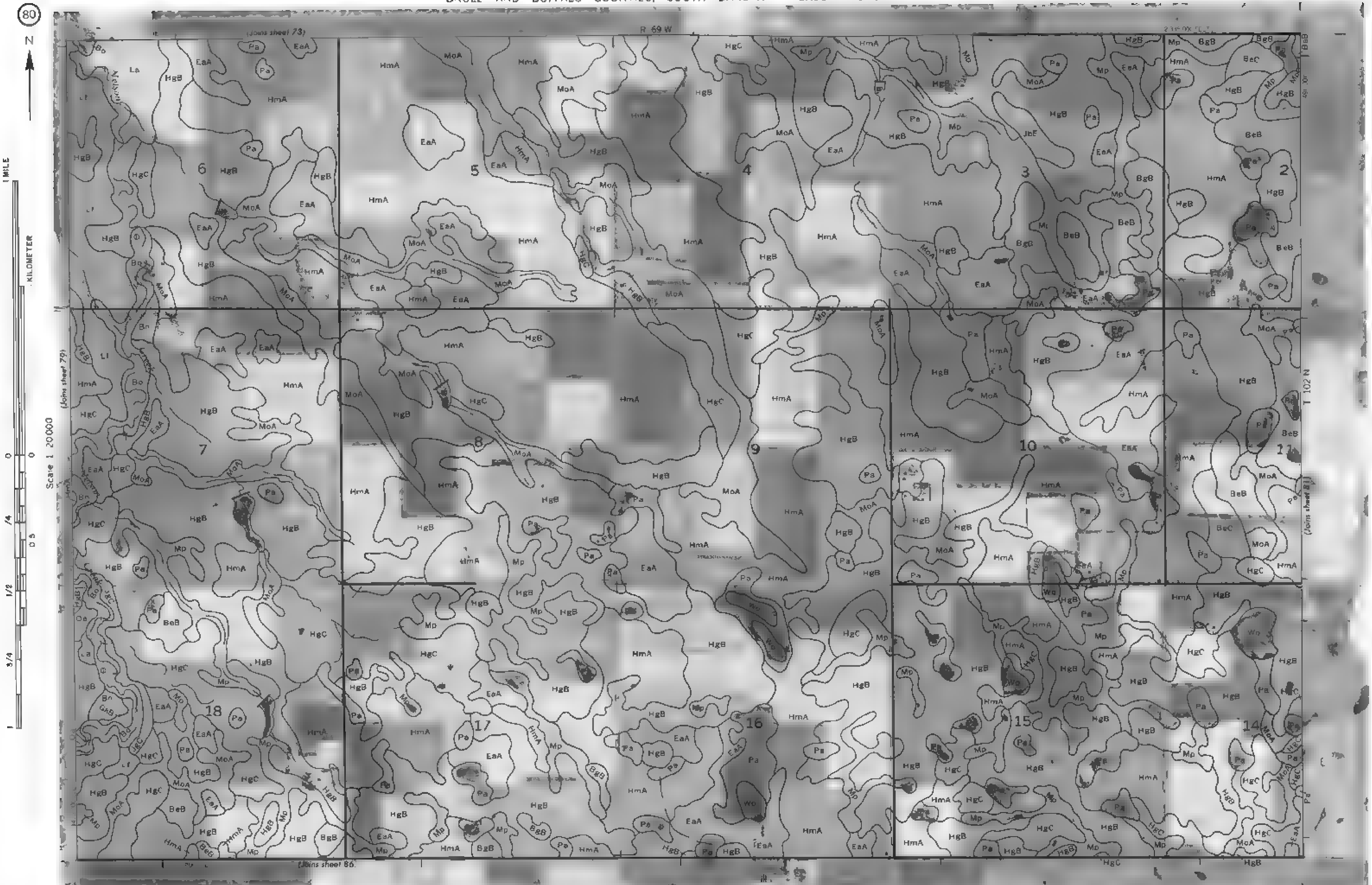
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 77


78
N
(Joins sheet 71)
R. 71 W
R. 70 W
(Joins sheet 79)
Joins sheet 84
Scale 1:20000
1 MILE
KILOMETER
0
1/4
1/2
3/4
1
0.5
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 78

79

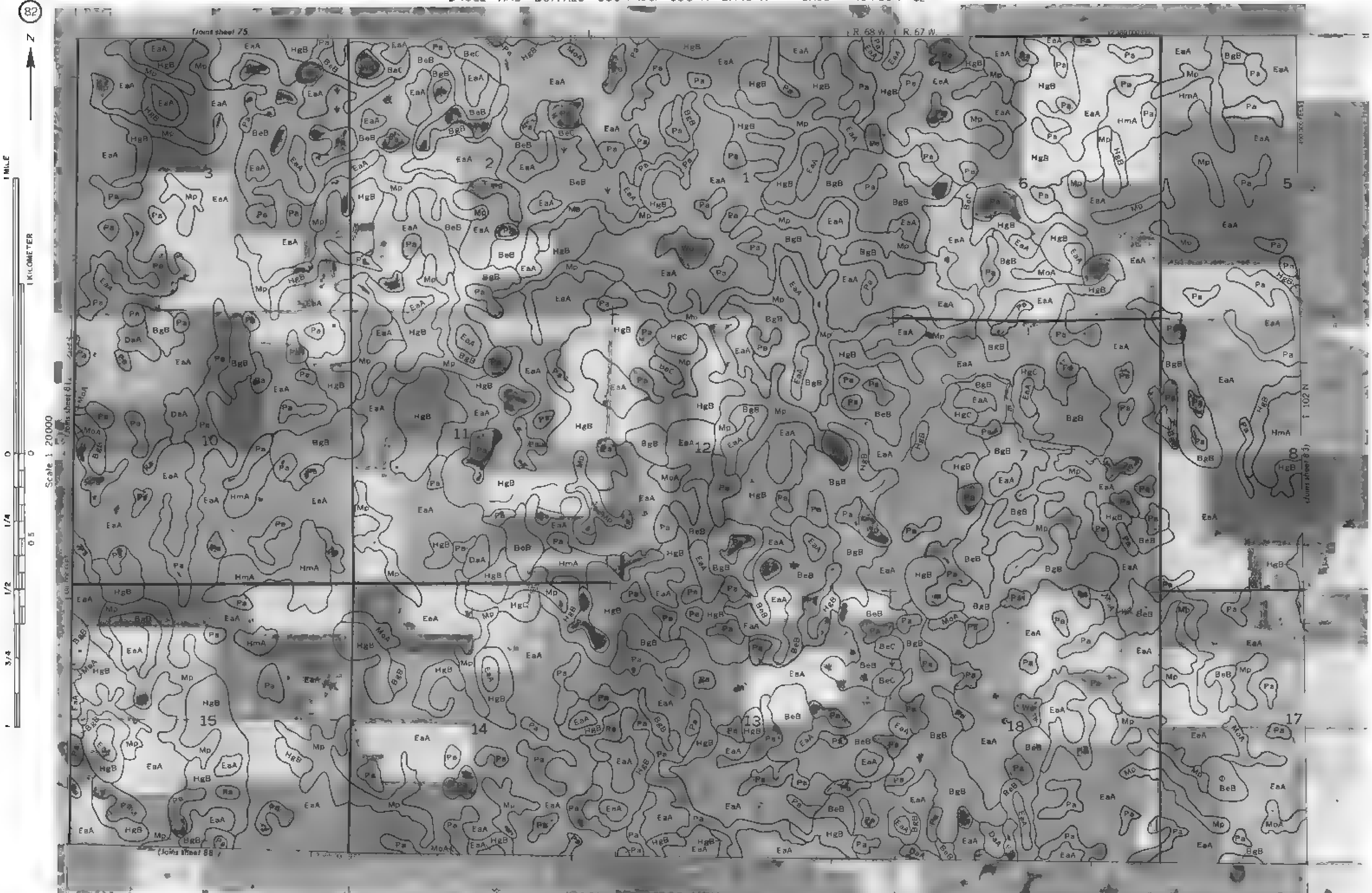


BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO. 79

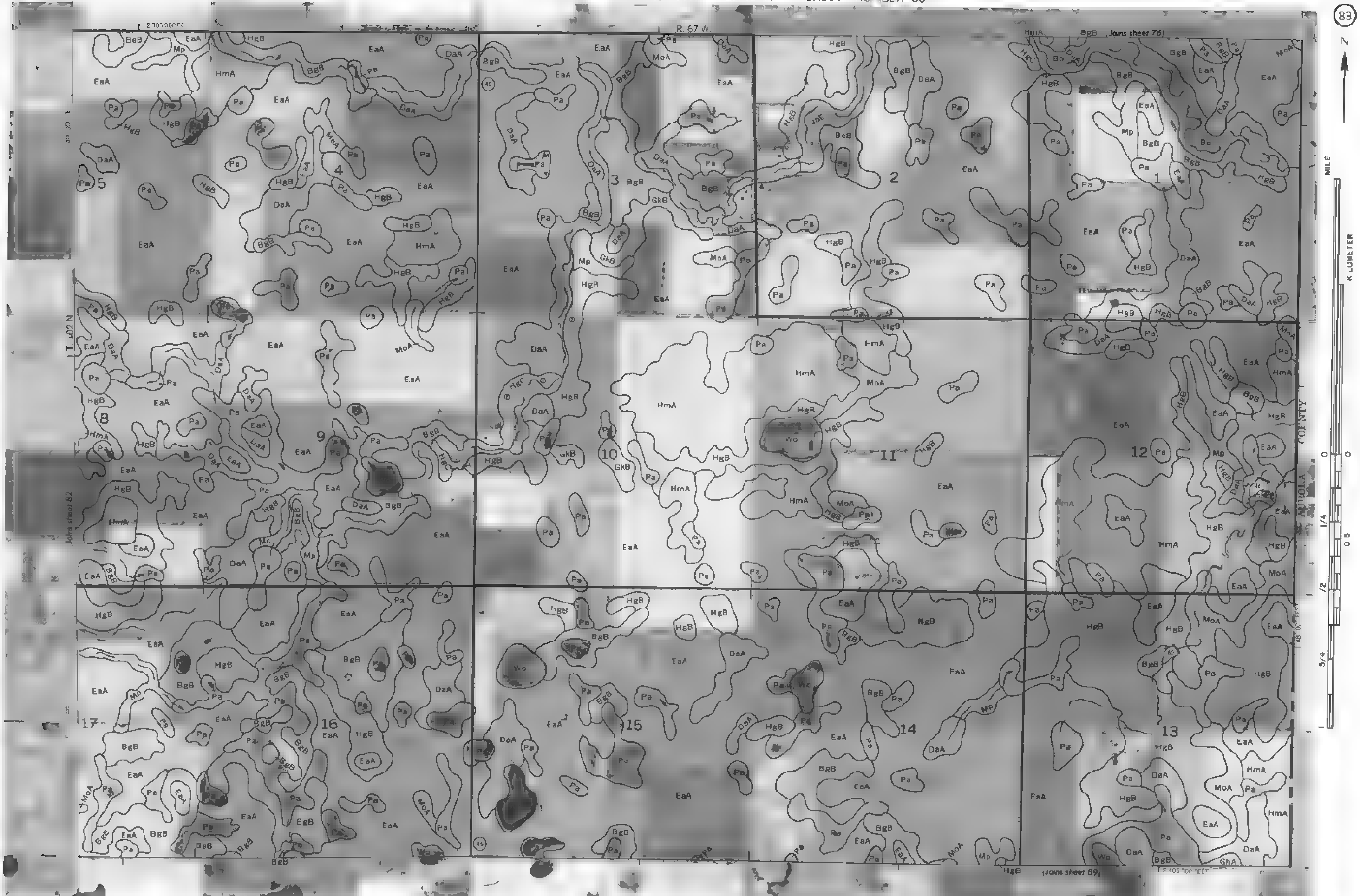


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 80

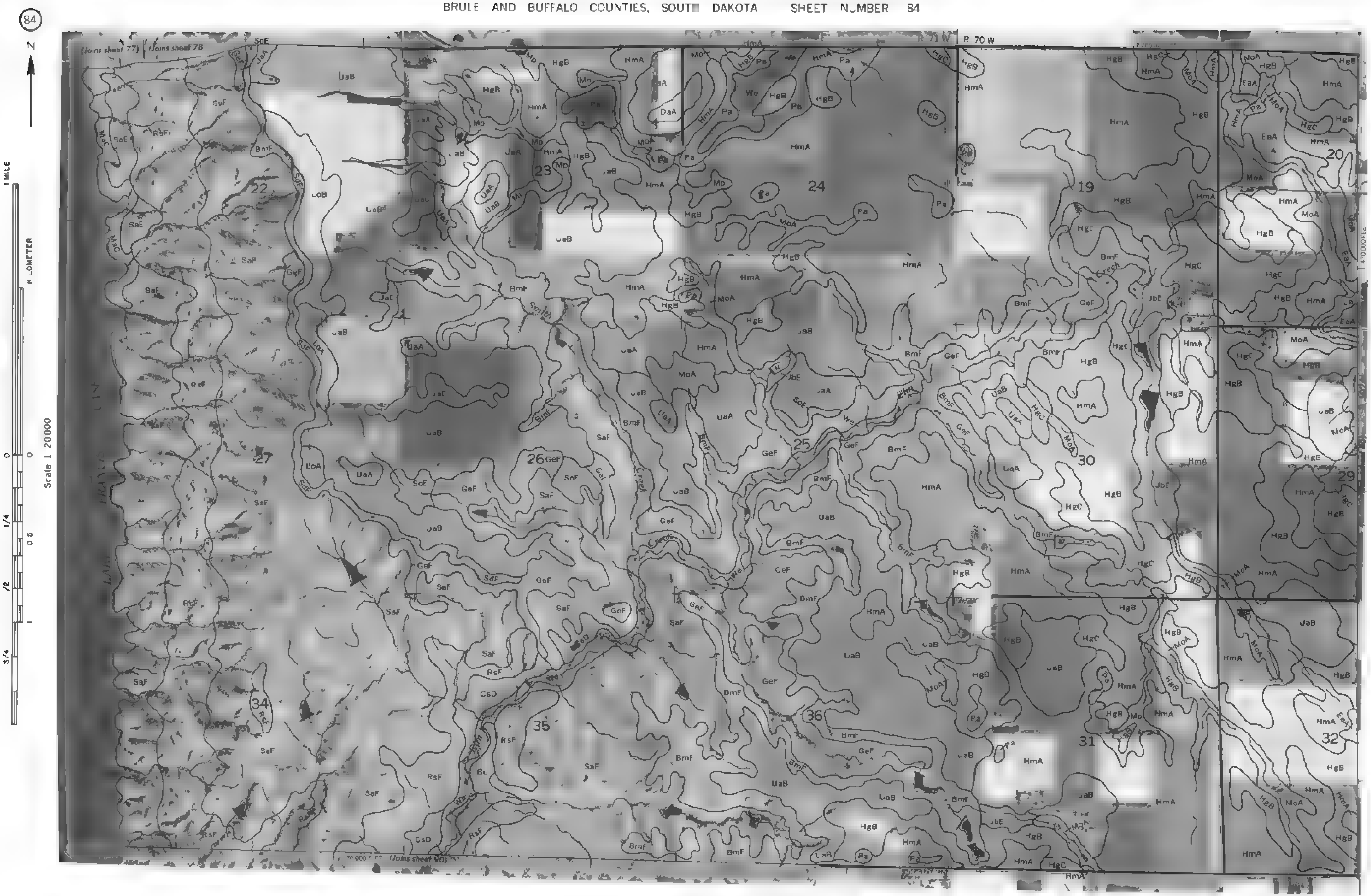
BRULE AND BUFFALO COUNTIES SOUTH DAKOTA — SHEET NUMBER 81



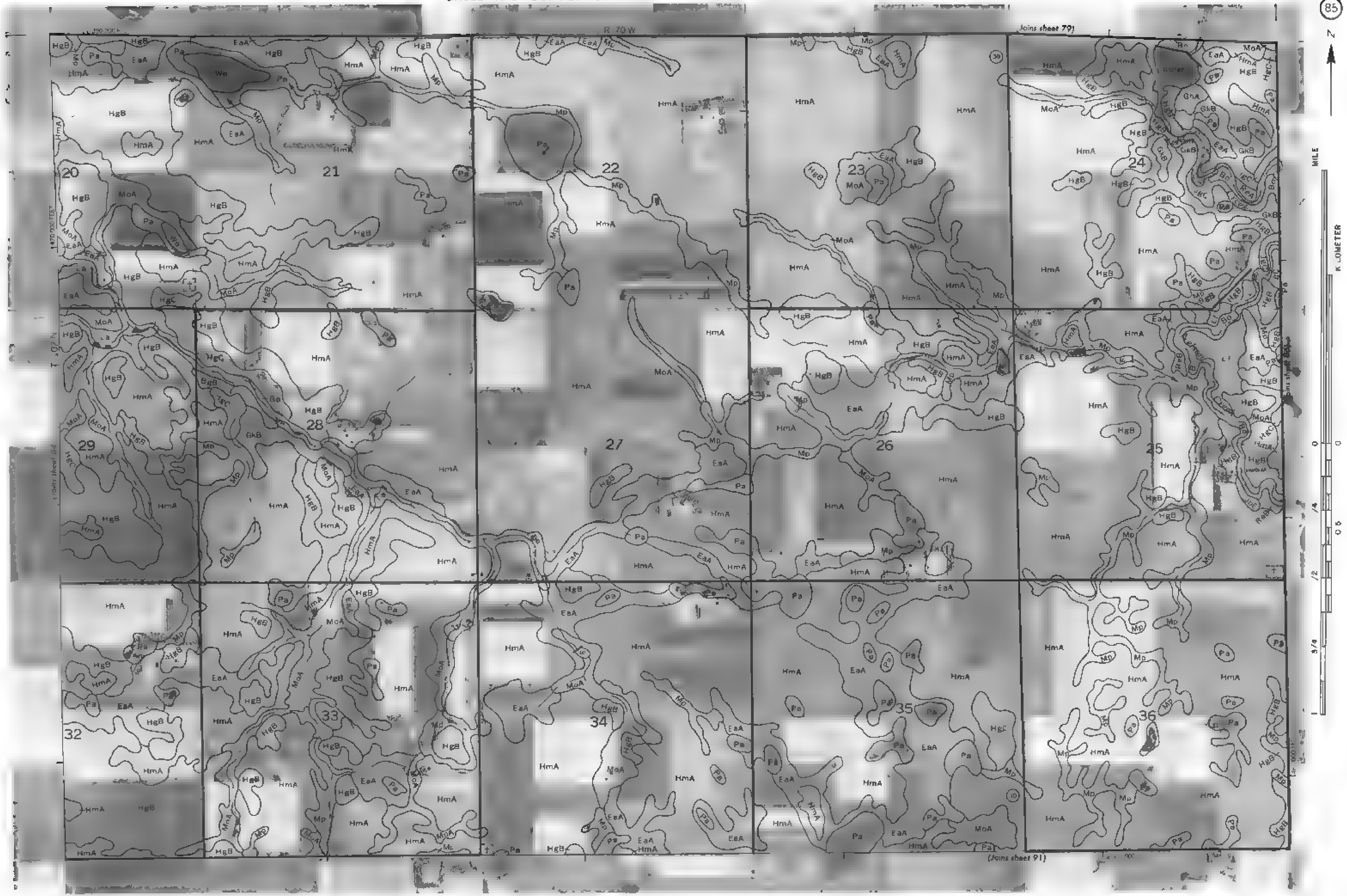
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 82

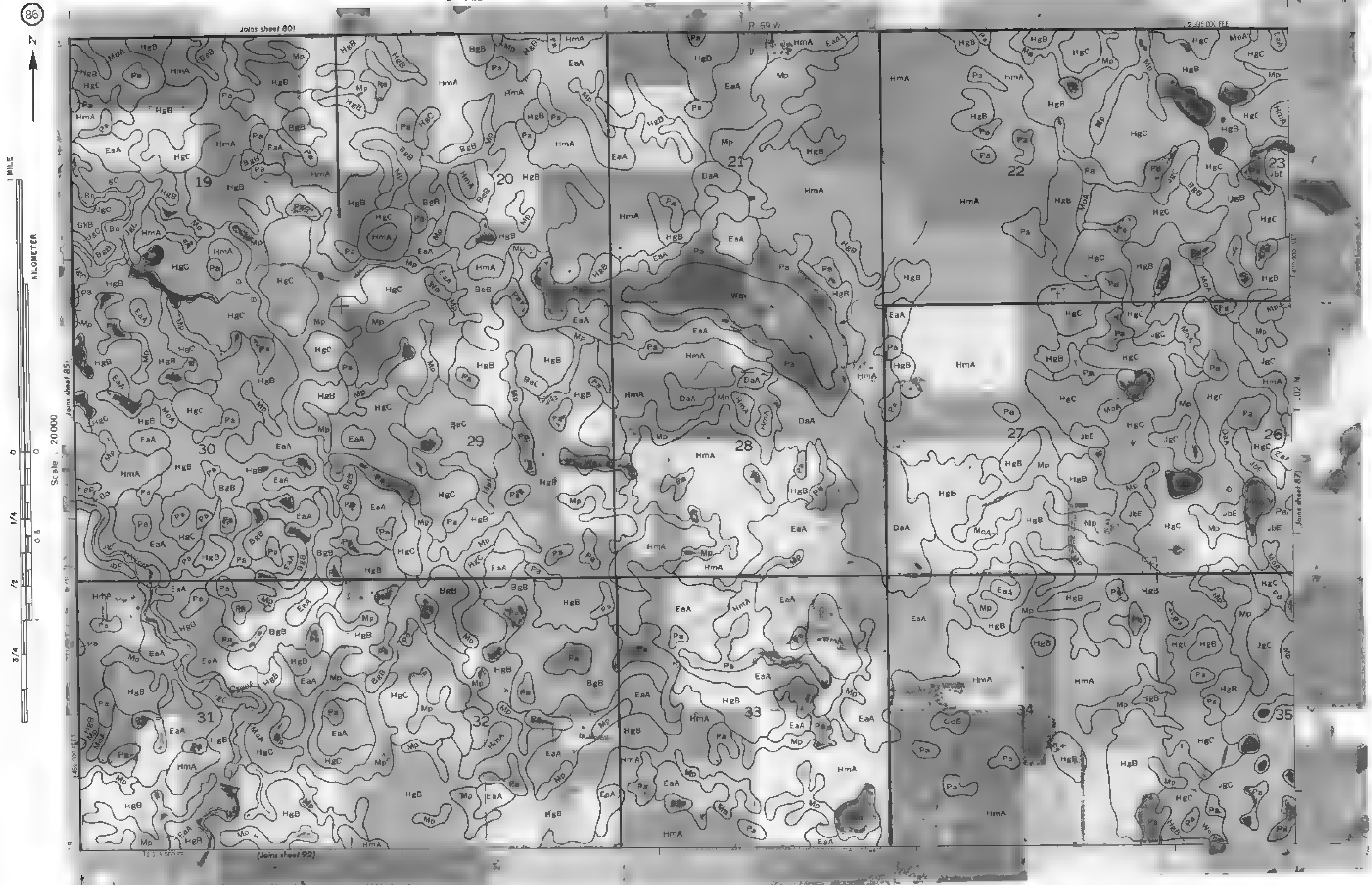


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 83


84
N
1 MILE
KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
0.5
1
(Joins sheet 77)
(Joins sheet 78)
(Joins sheet 90)
R 71 W
R 70 W
19
20
22
23
24
25
26
27
29
30
31
32
34
35
36
Smith Creek
Wet Creek
Elm Creek
HmA
HgB
HgC
MoA
UaB
UaA
BmF
GeF
SaF
RsF
Pa
JbE
CsD
EaA
DaA

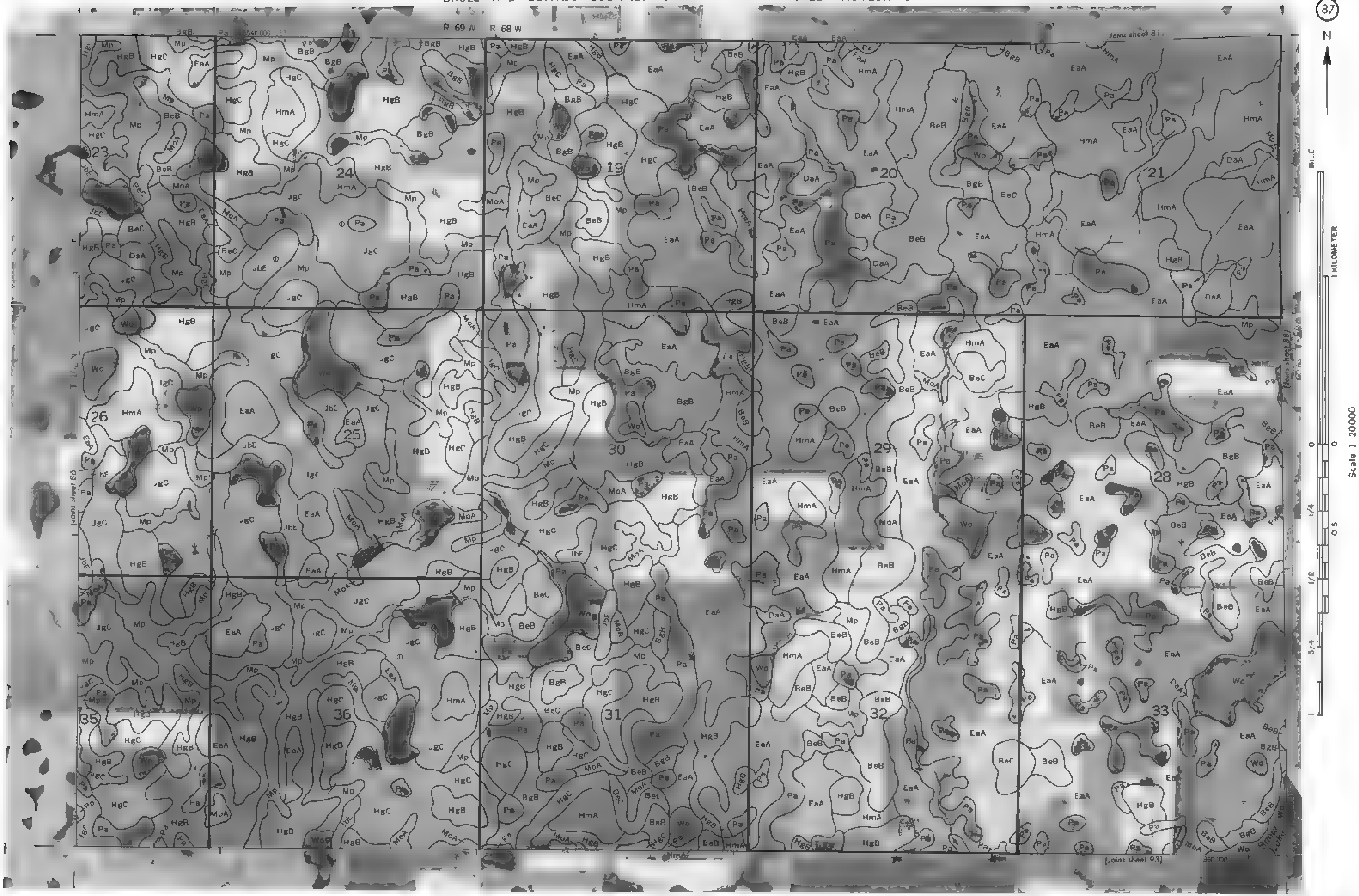
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 85



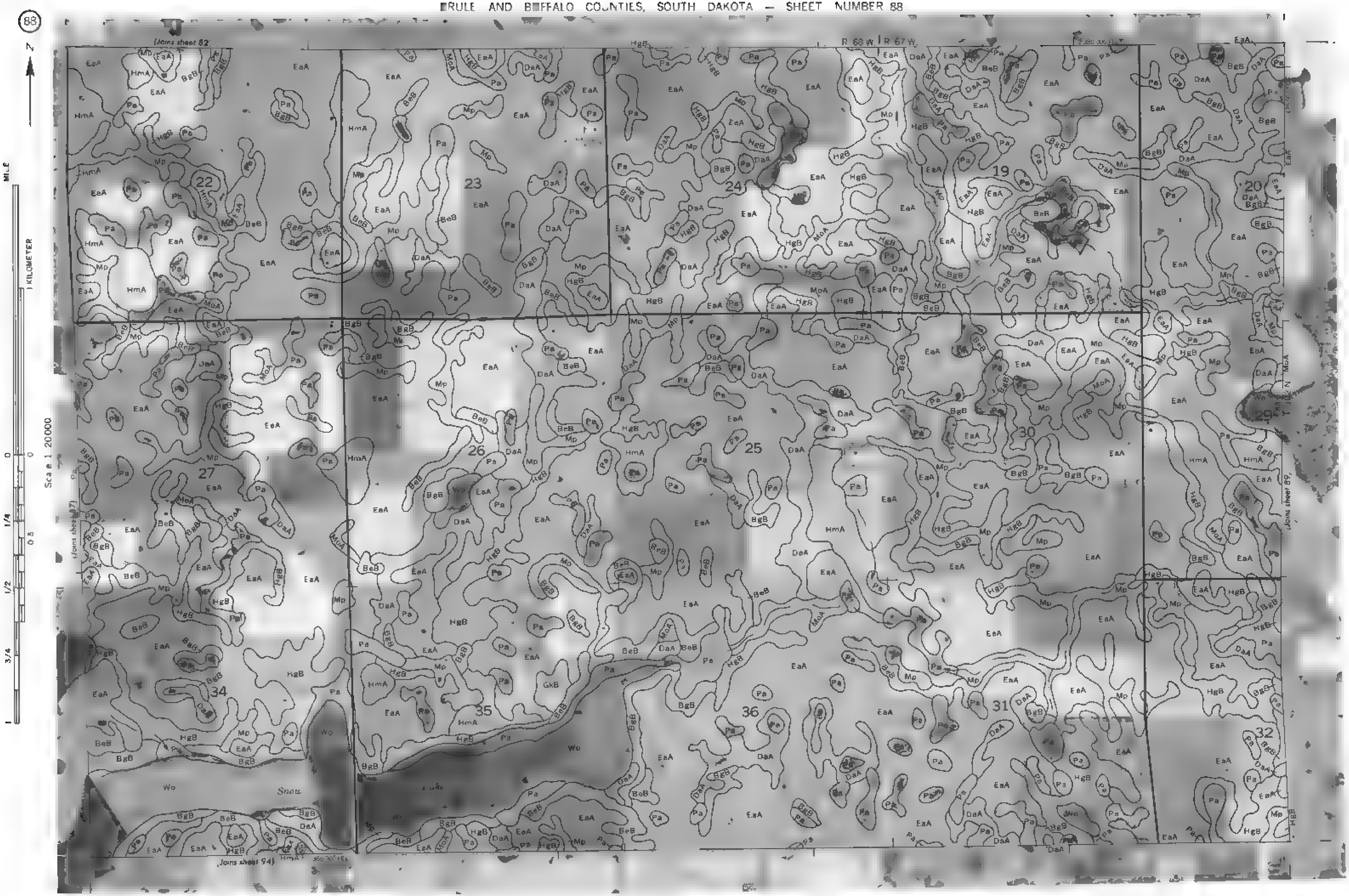


BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 86

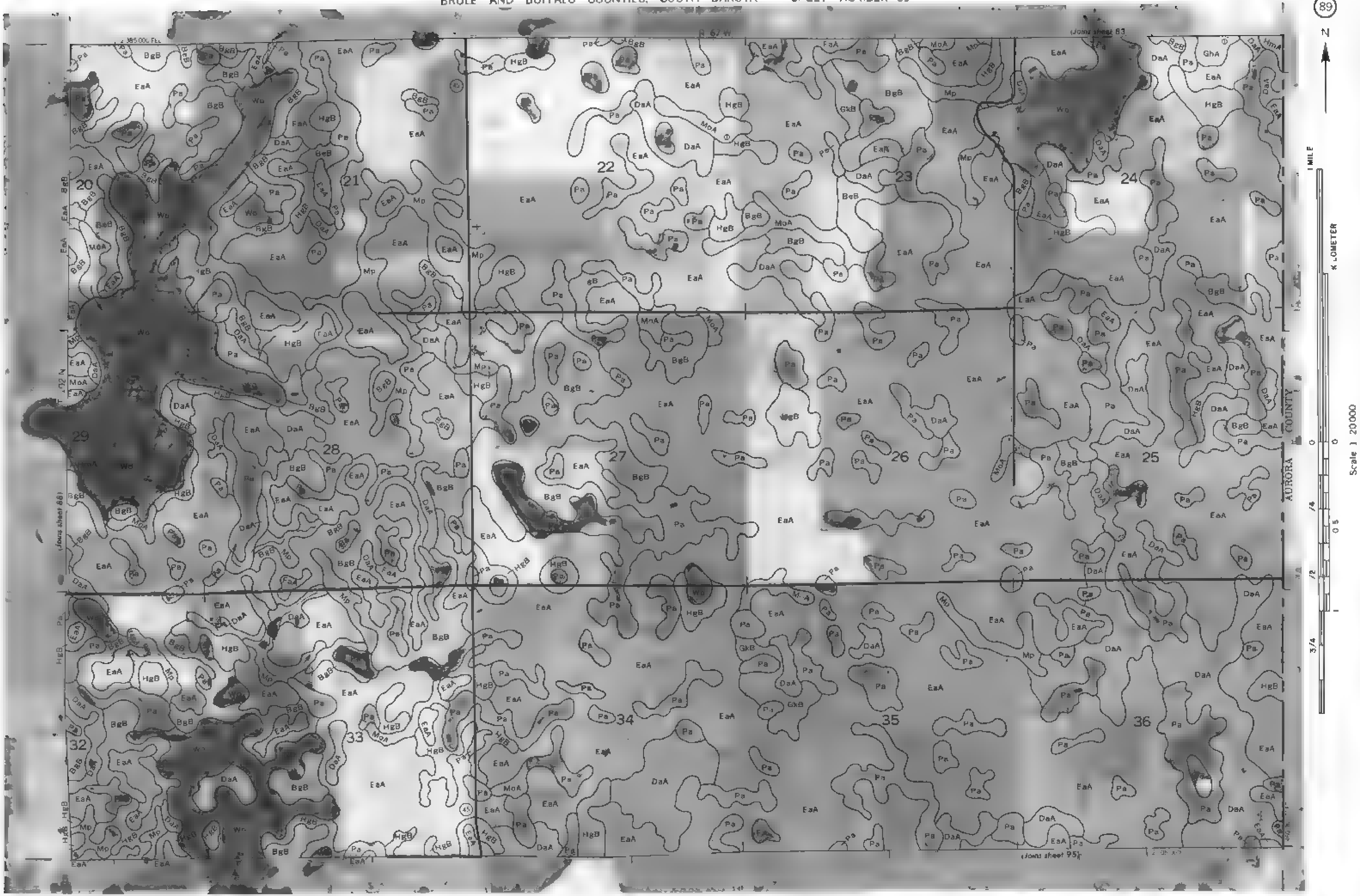
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 87



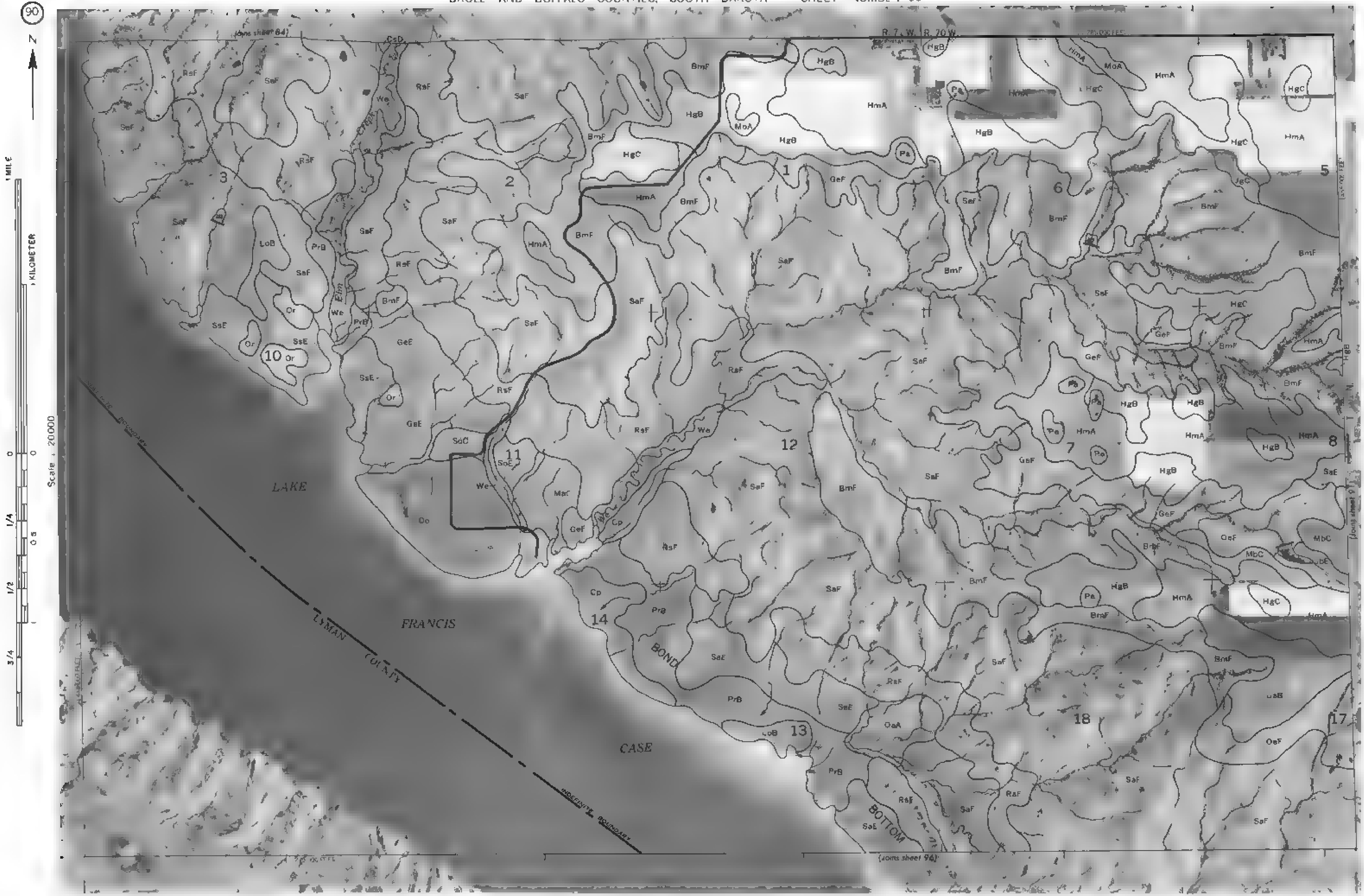
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 87



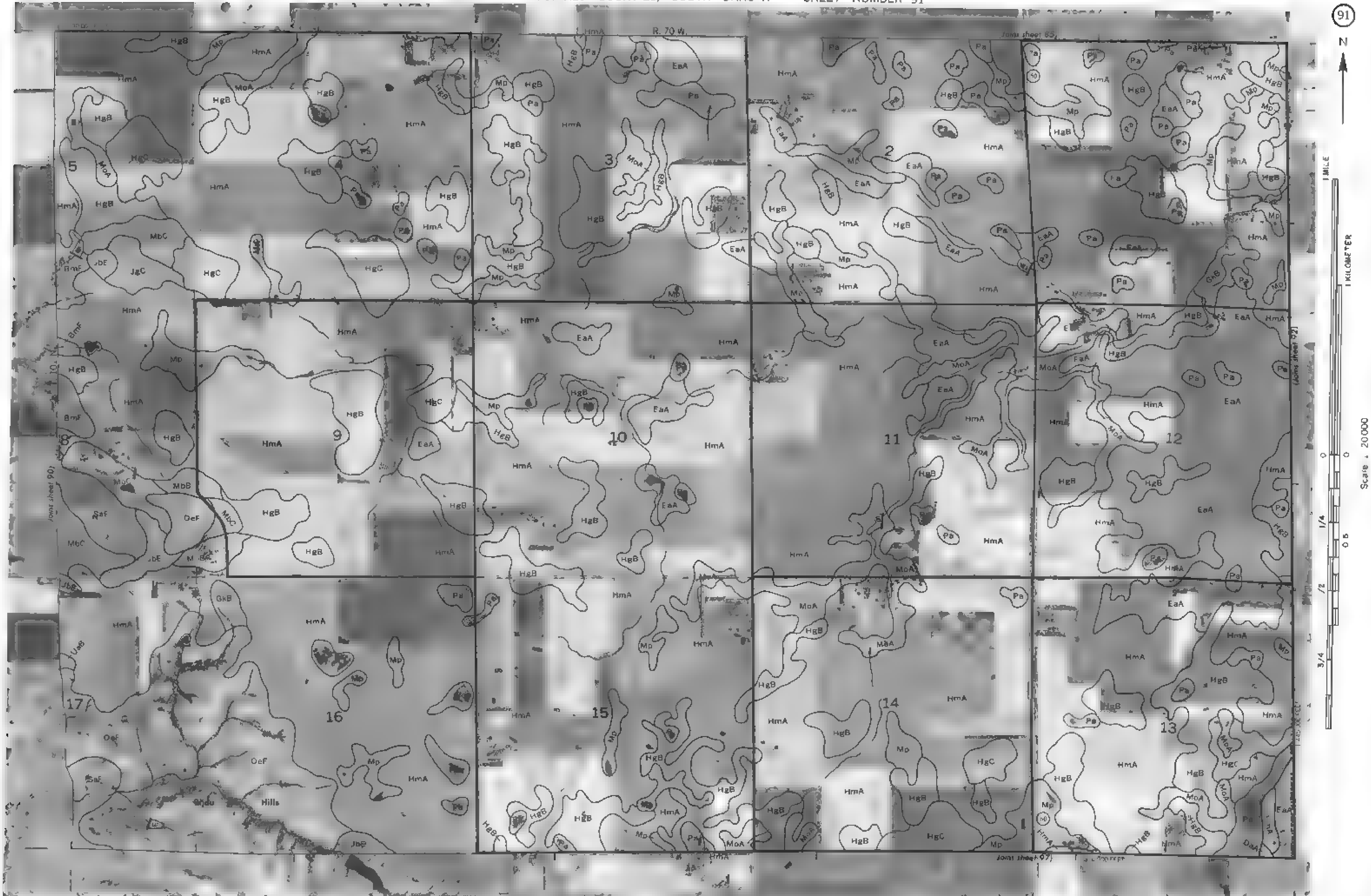
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 88


(Joins sheet 83)
(Joins sheet 95)
(Joins sheet 88)
AURORA COUNTY
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
N
1 MILE
KILOMETER
Scale 1:20000
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 89

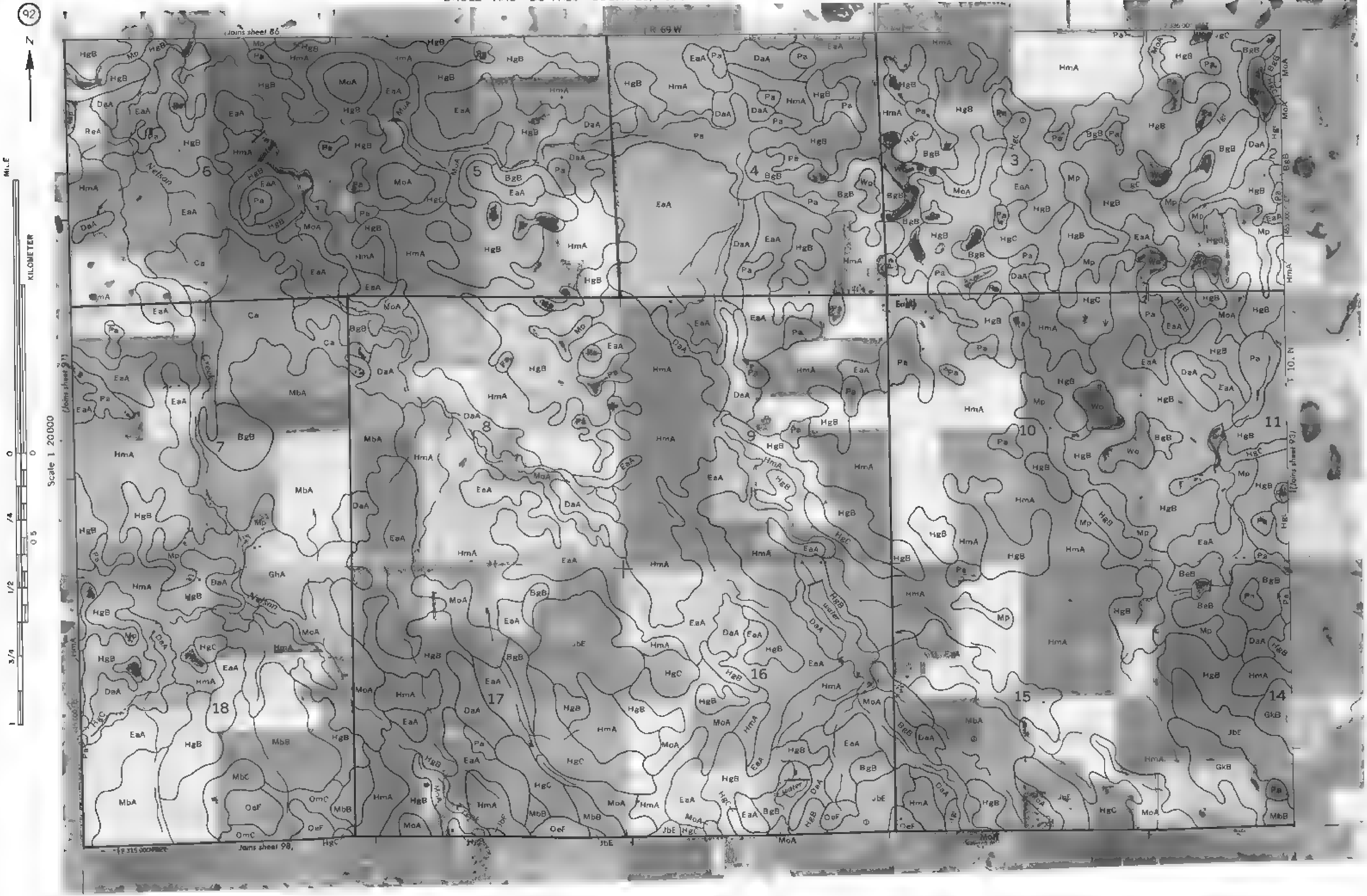
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 90



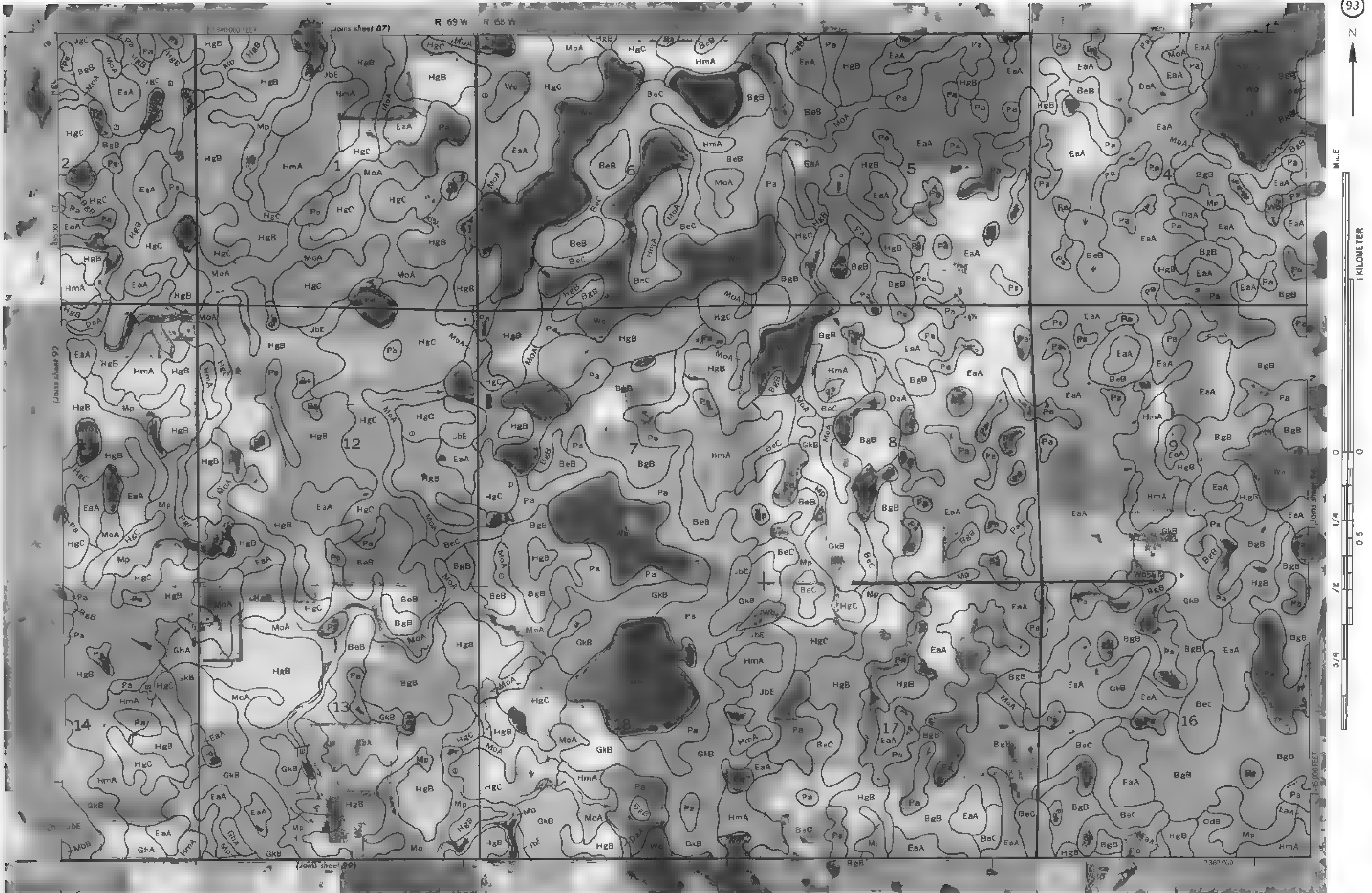
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO 90



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 91

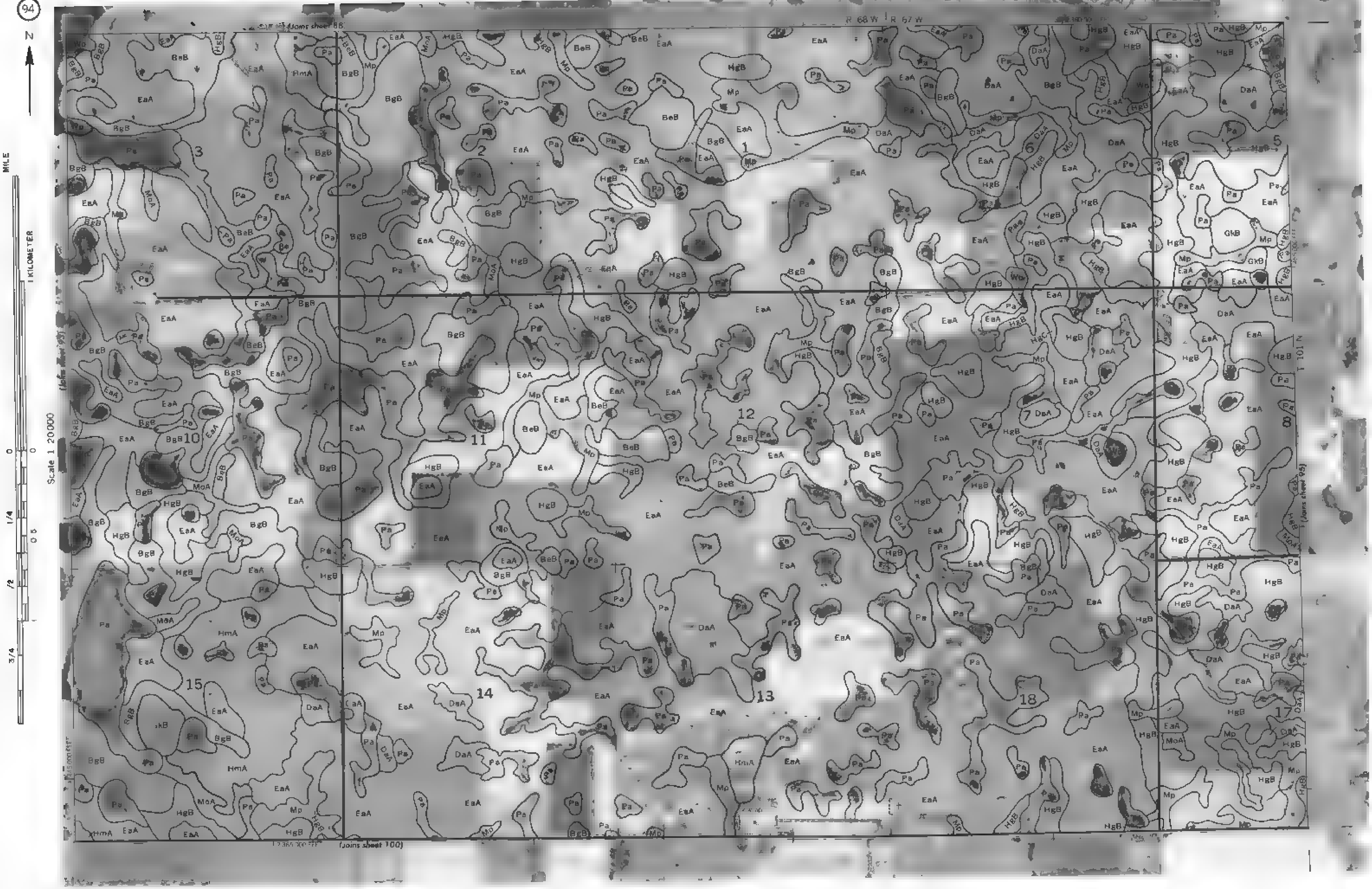


BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 92



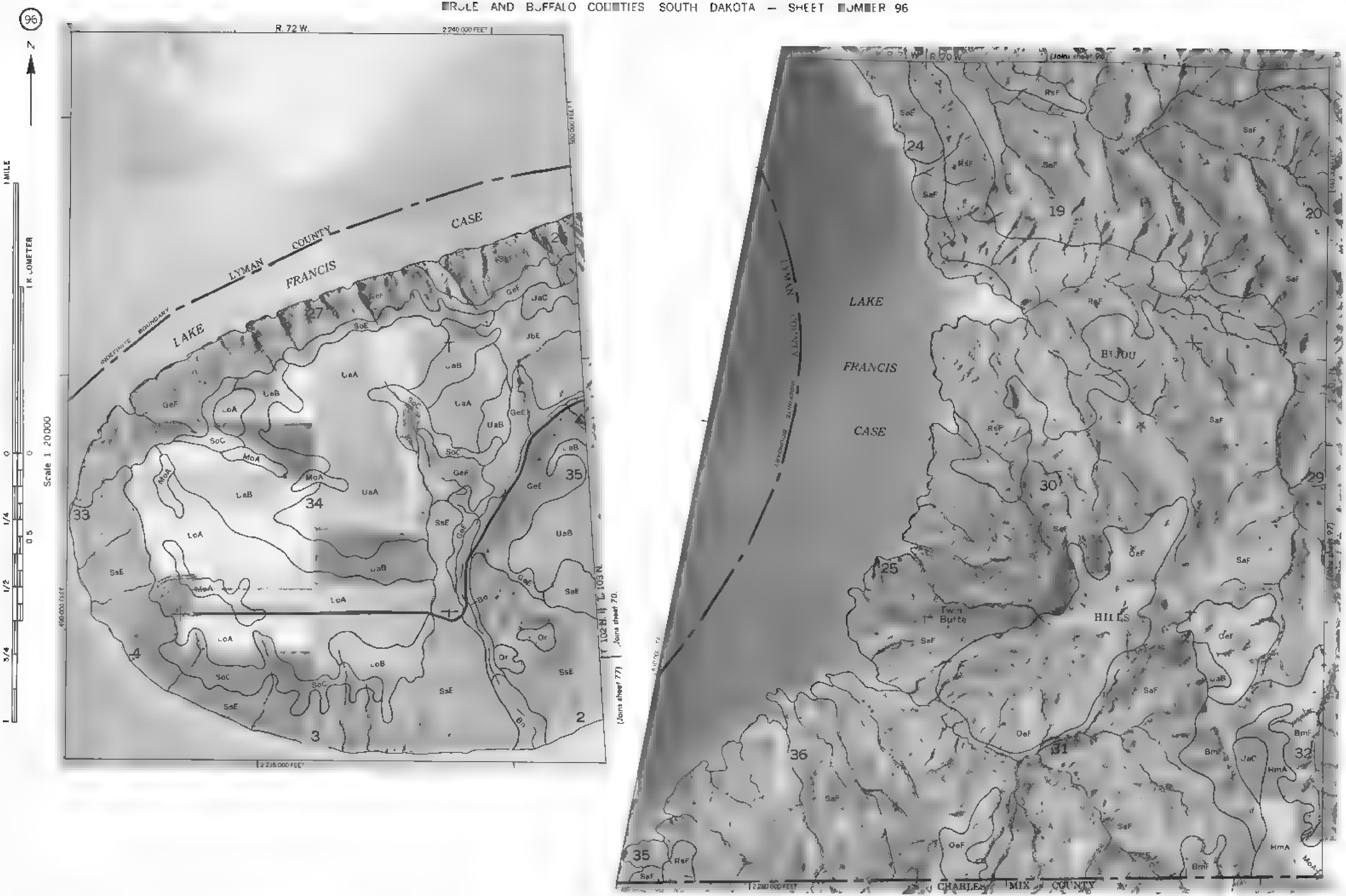
BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 93

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA — SHEET NUMBER 94



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 94

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 95

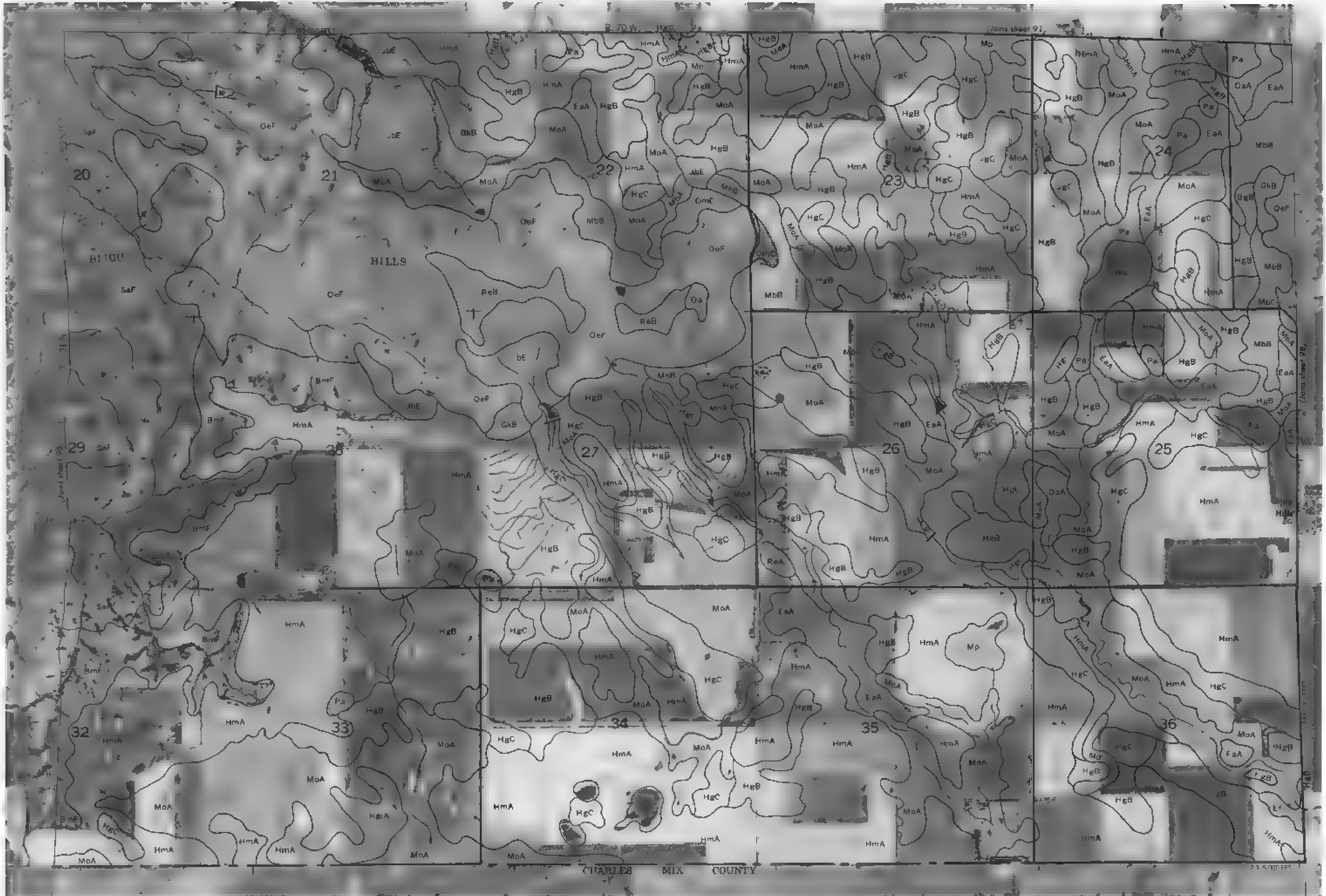


BRULE AND BUFFALO COUNTIES SOUTH DAKOTA NO 96

97

N

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 97

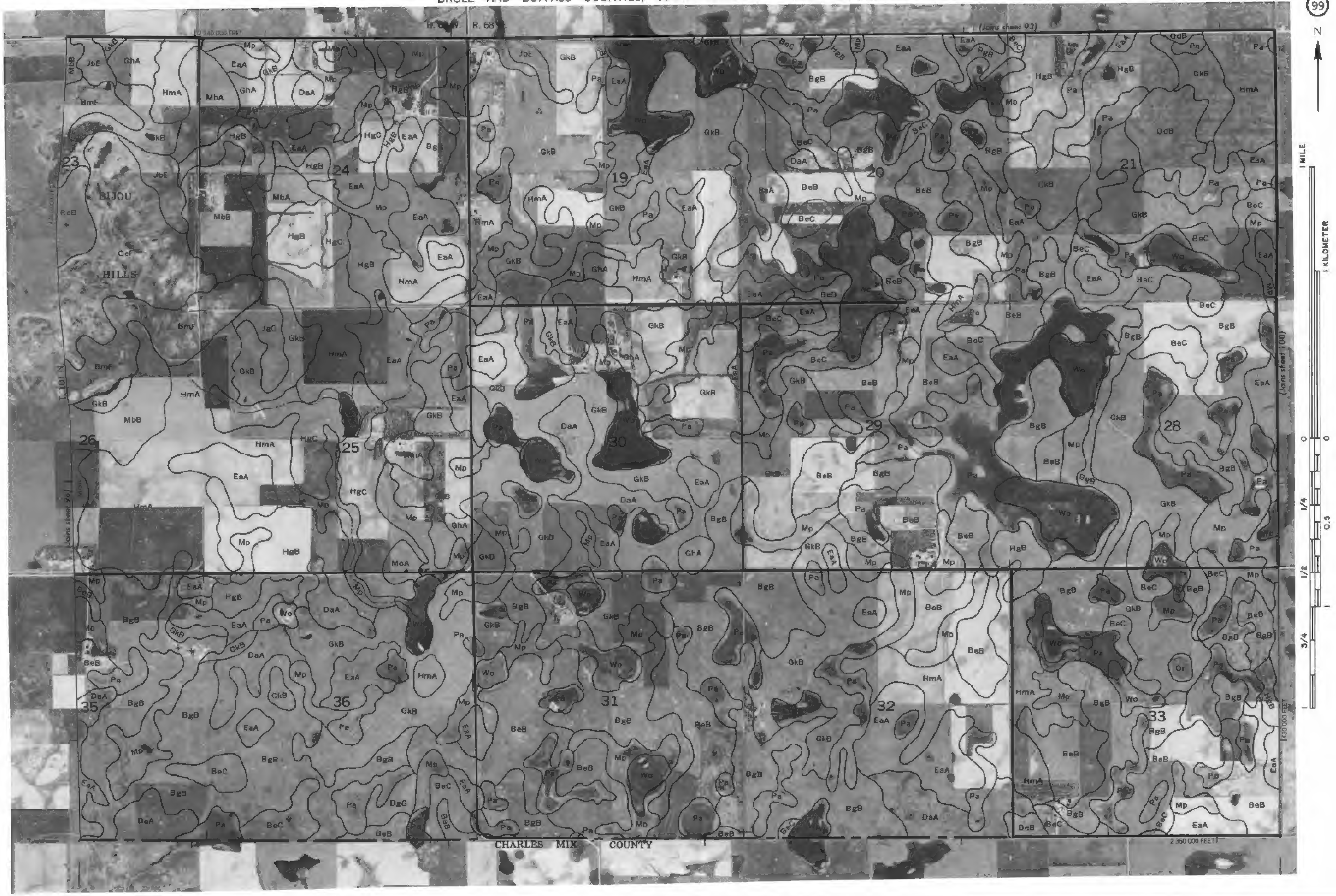


MILE

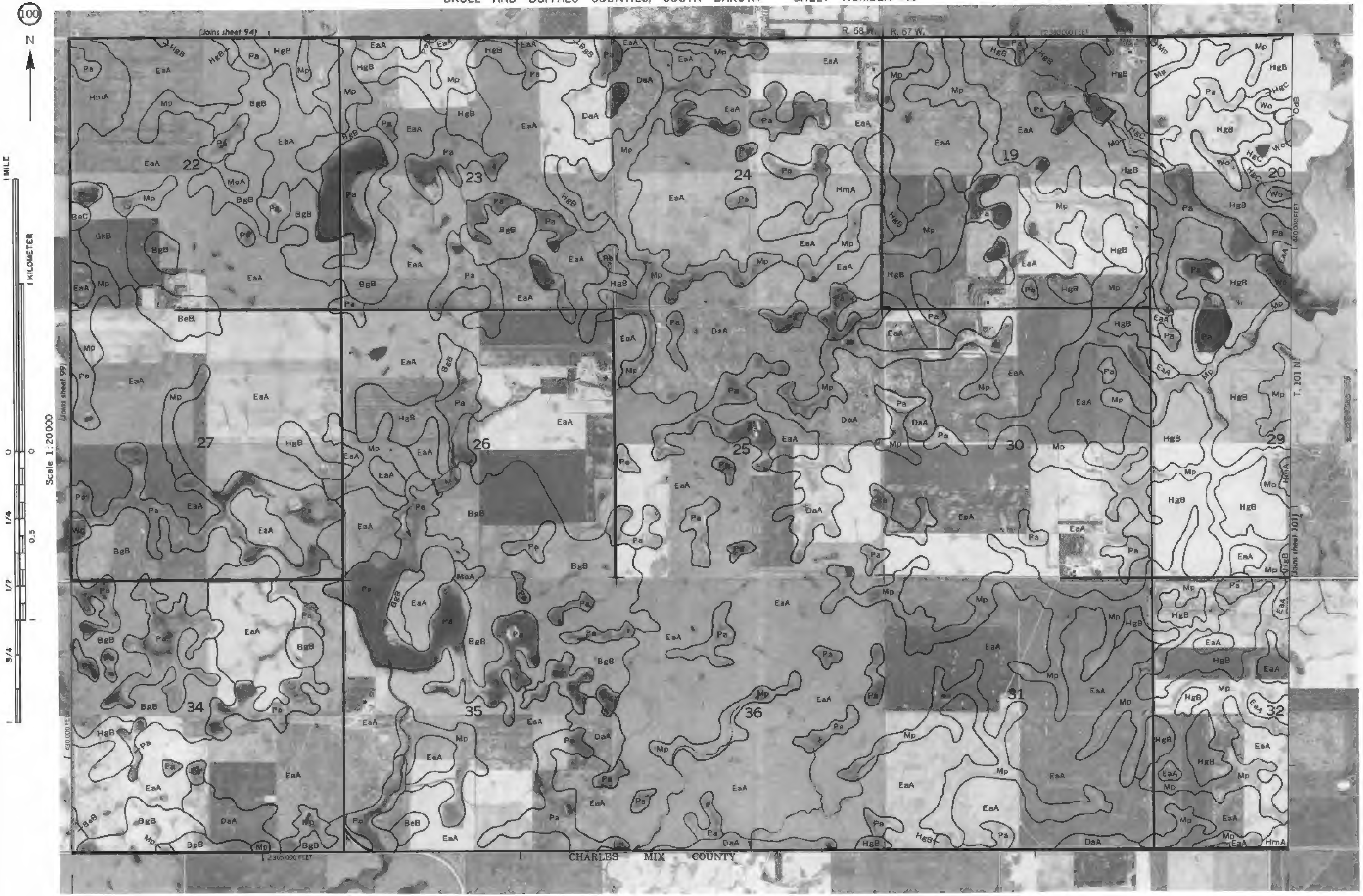
KILOMETER

Scale 1:20000

BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 98



BRULE AND BUFFALO COUNTIES, SOUTH DAKOTA NO. 99


100
N
1 MILE
1 KILOMETER
Scale 1:20000
(Joins sheet 94)
(Joins sheet 99)
(Joins sheet 101)
R. 68 W.
R. 67 W.
T. 101 N.
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CHARLES MIX COUNTY

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.